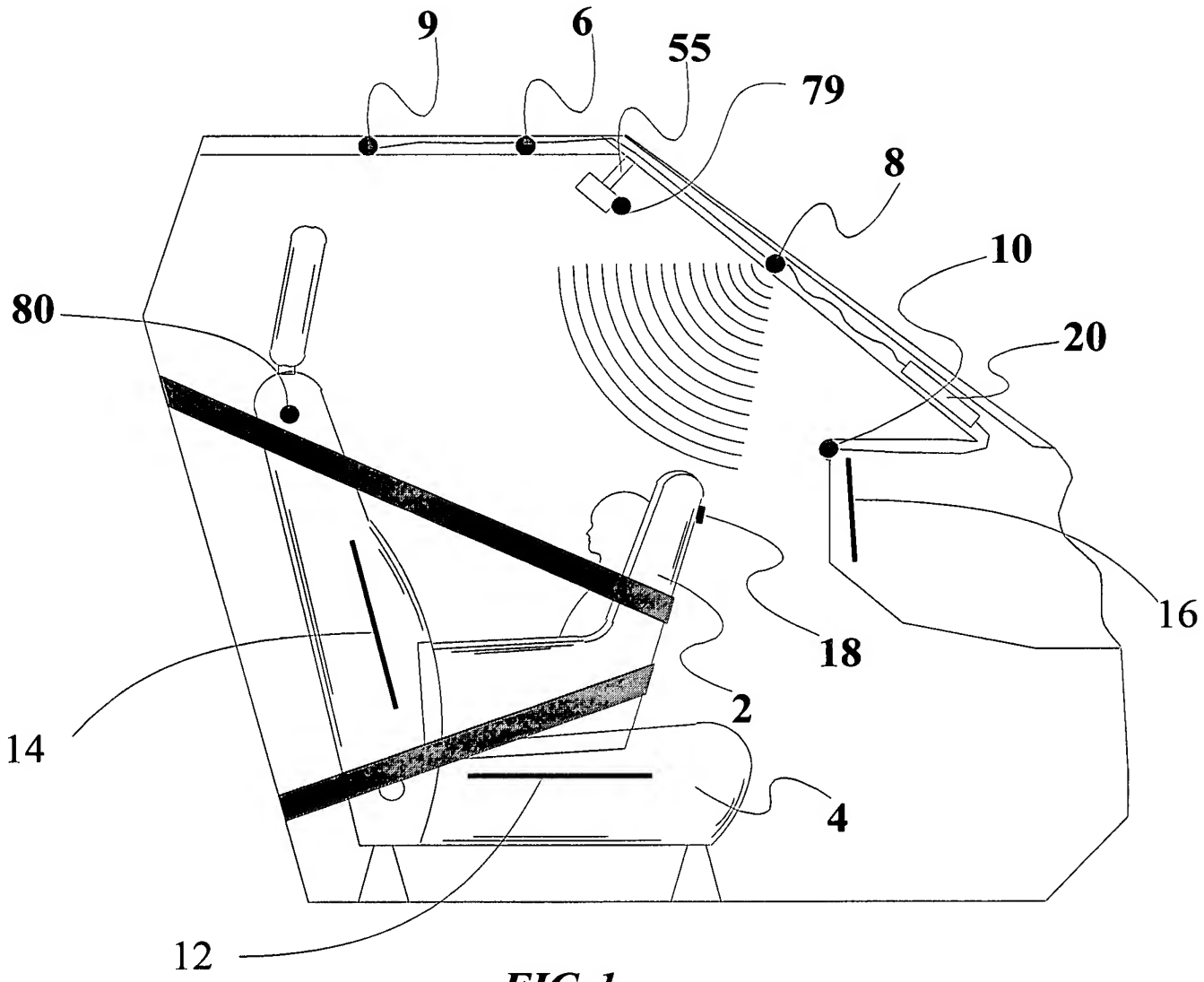


FIG. 1

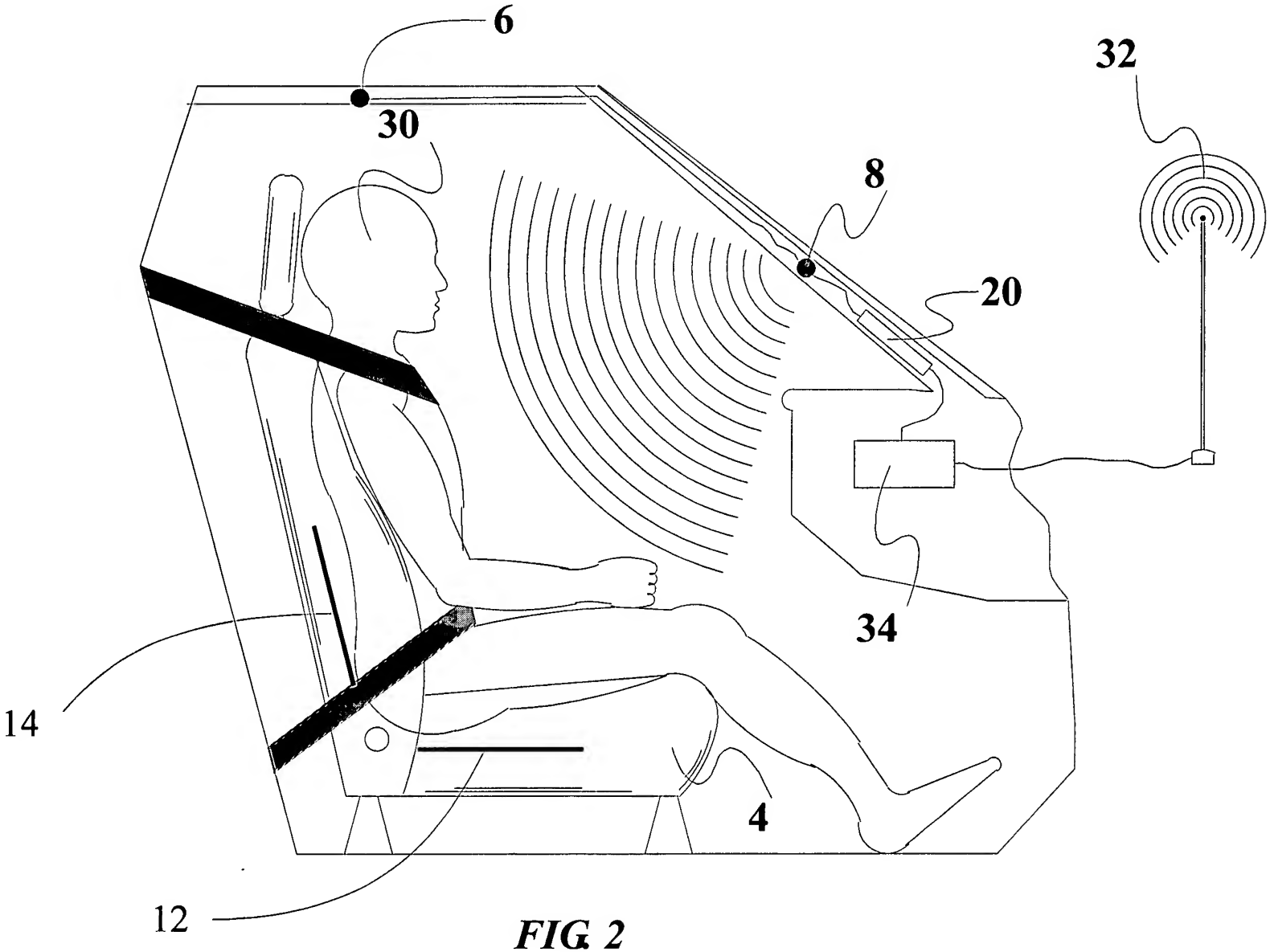


FIG. 2

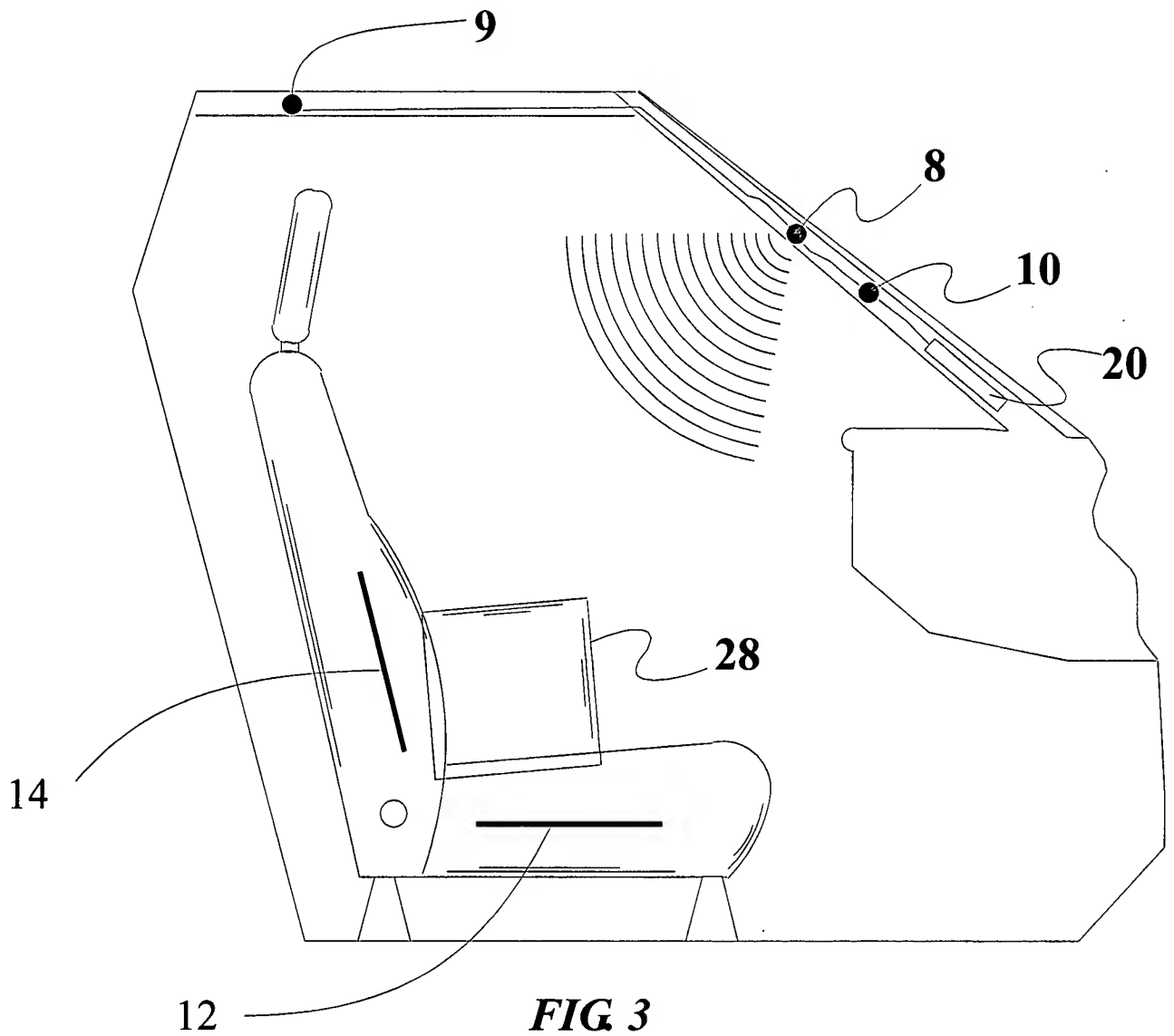


FIG. 3

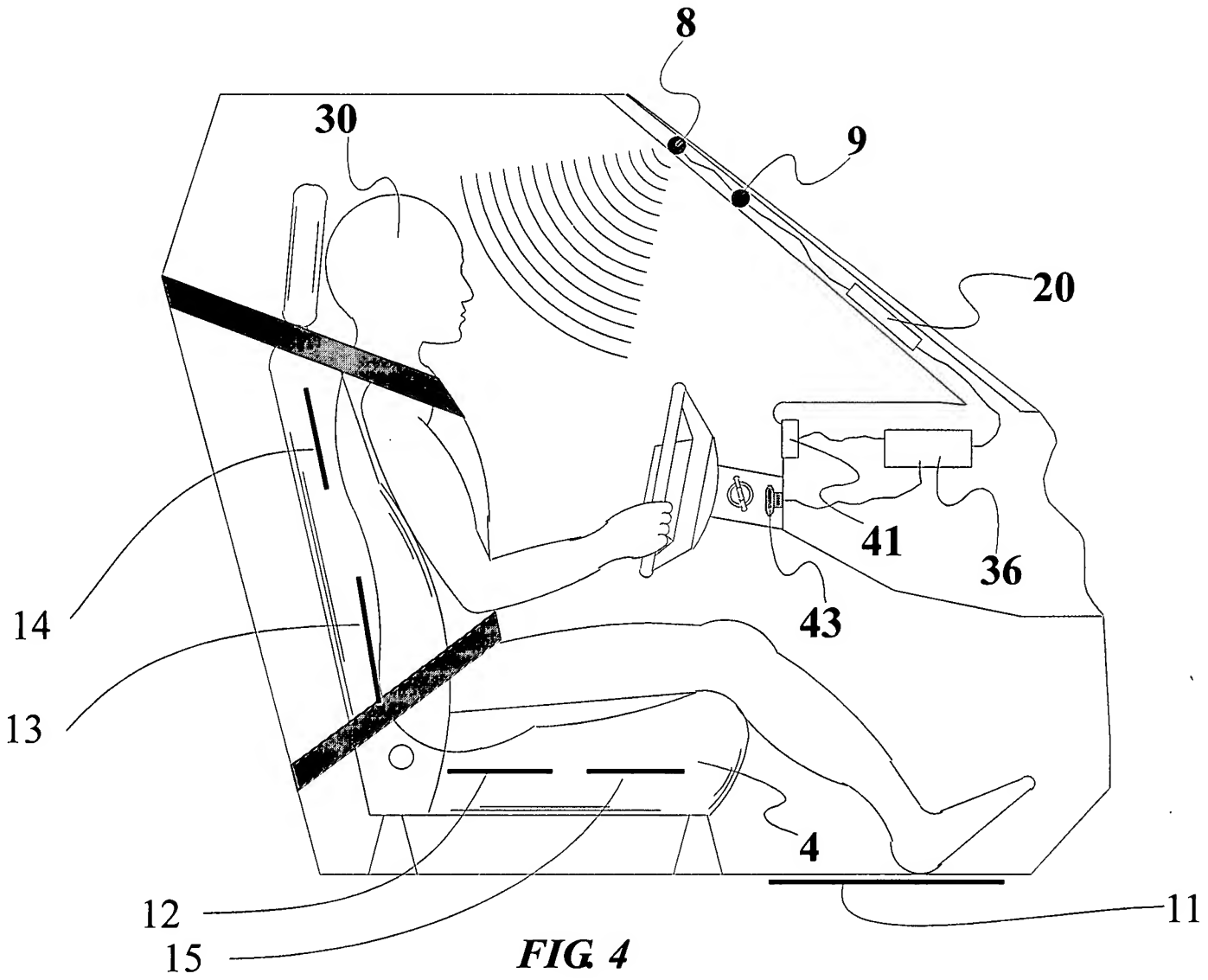
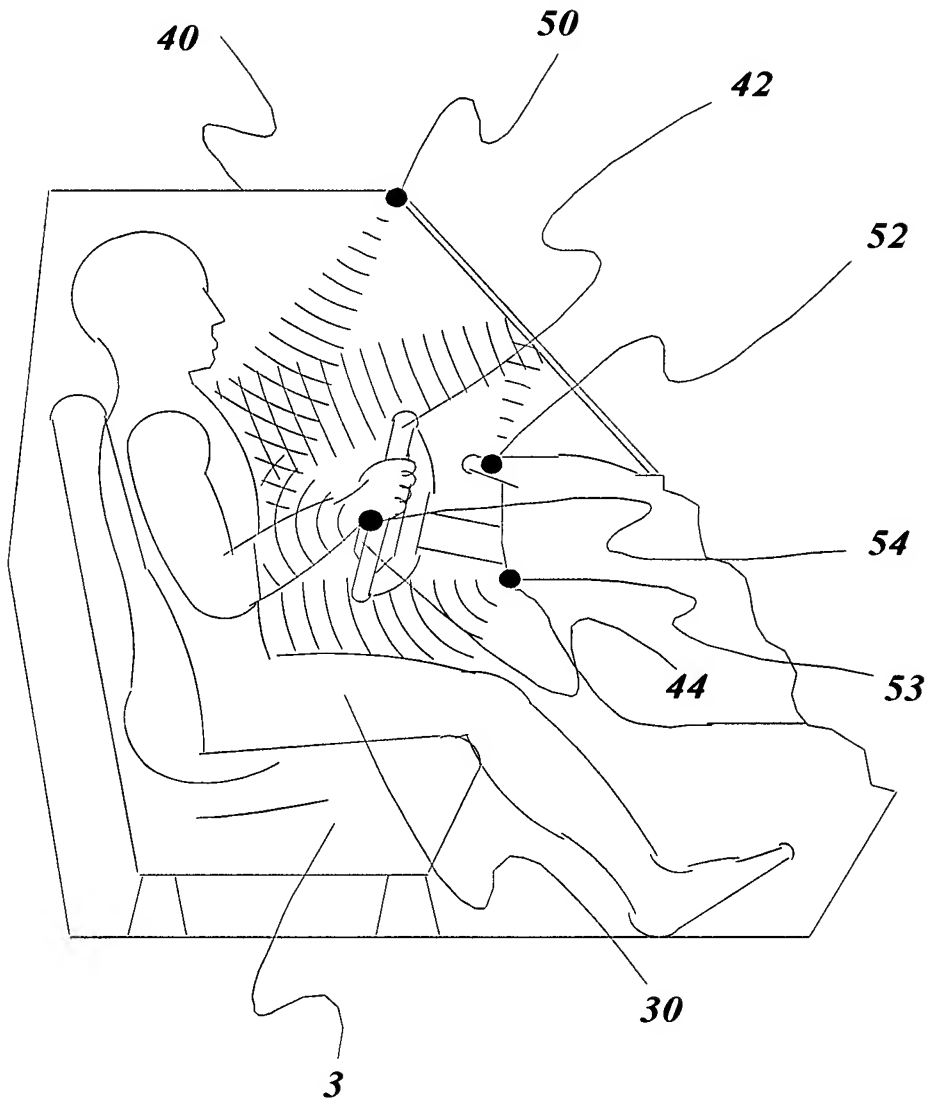


FIG. 4

FIG. 5



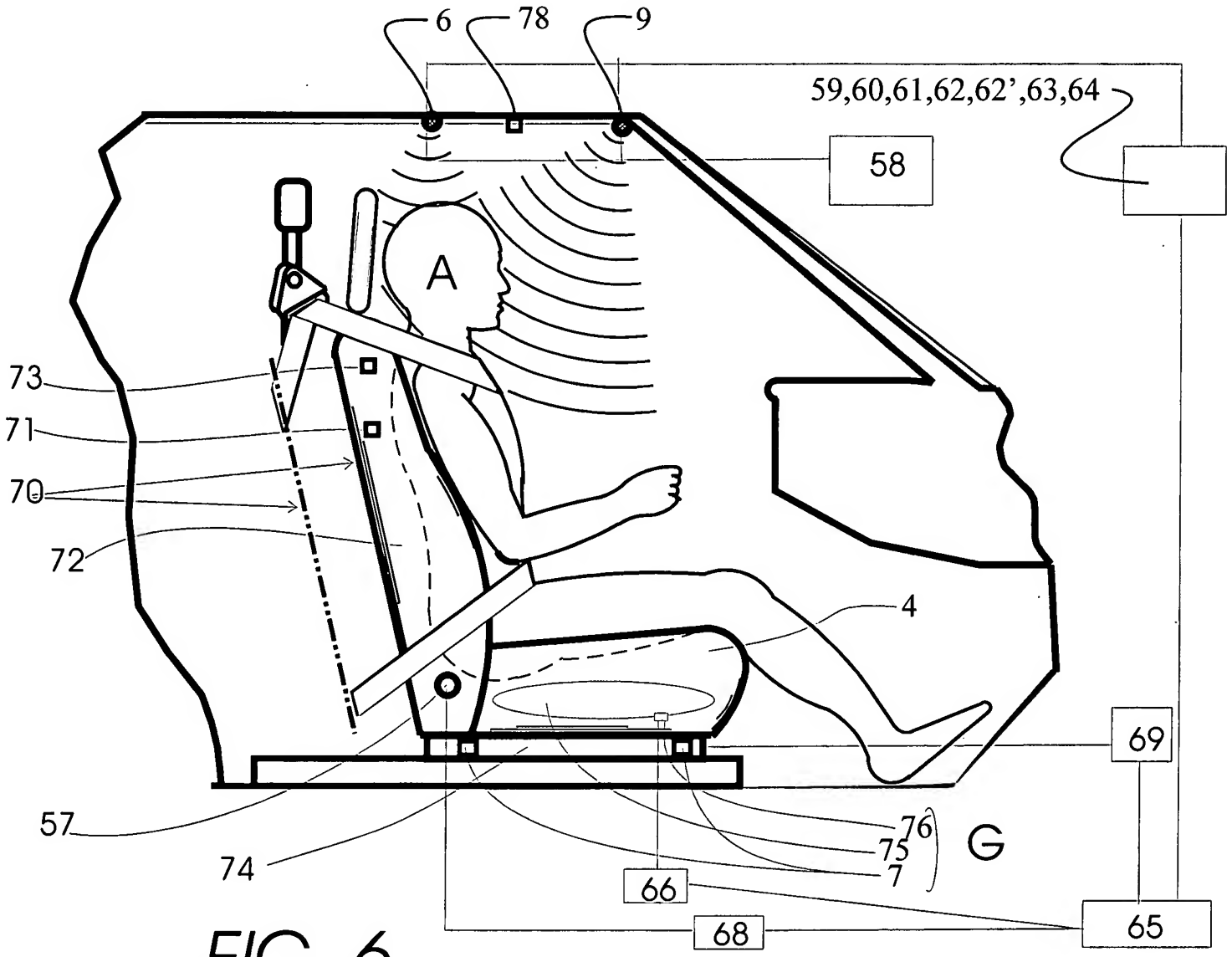


FIG. 6

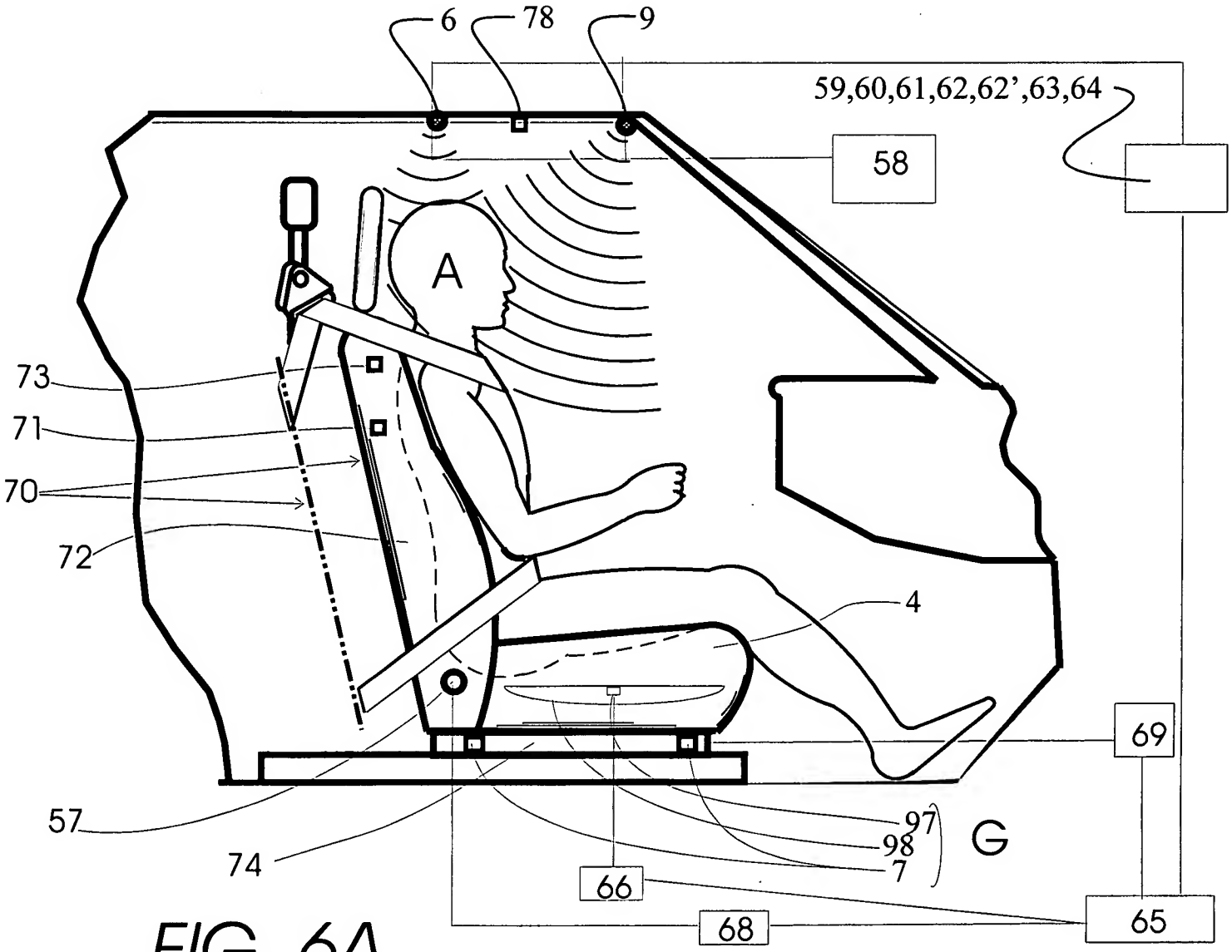


FIG. 6A

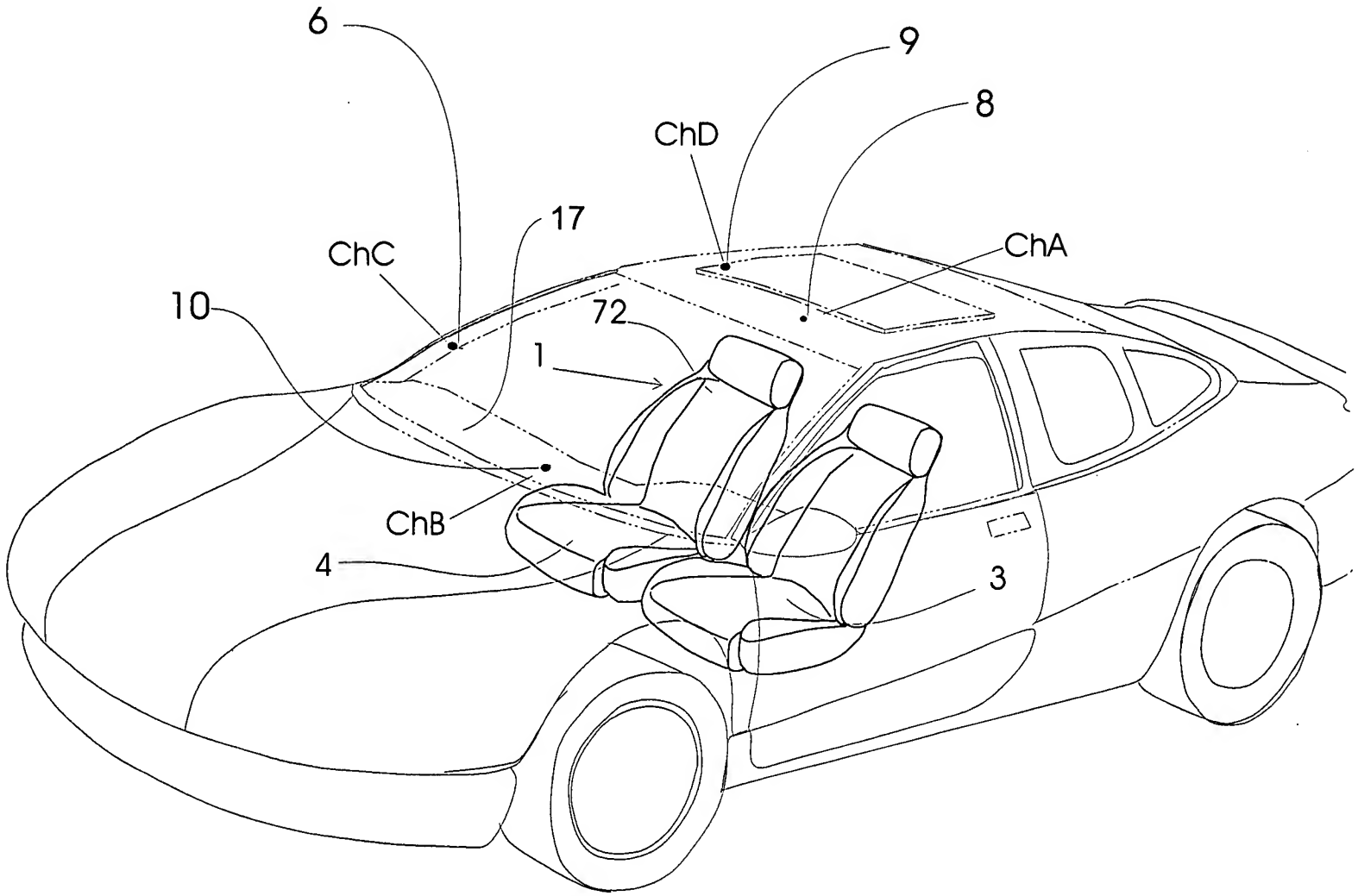


FIG. 7

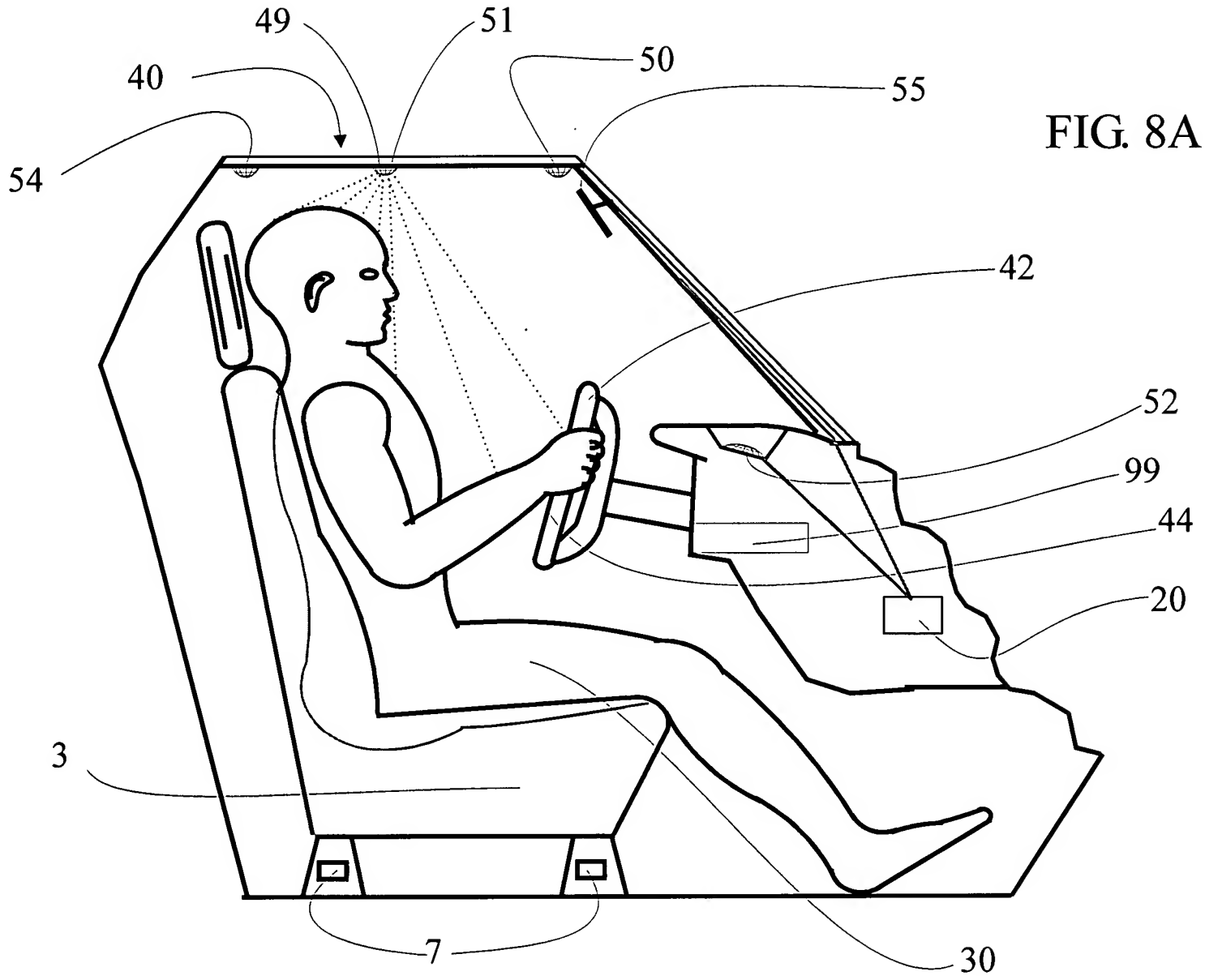


FIG. 8A

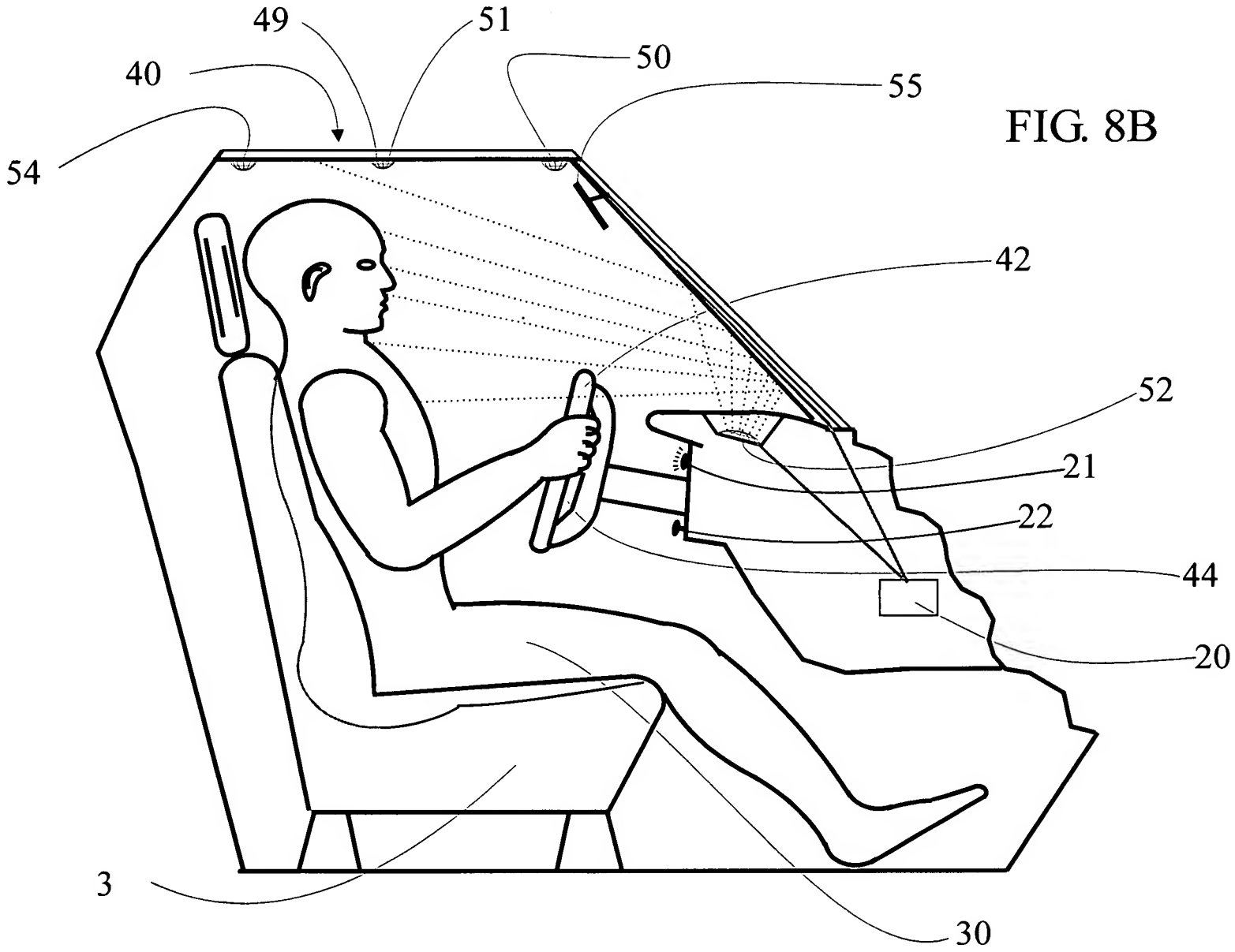


FIG. 8B

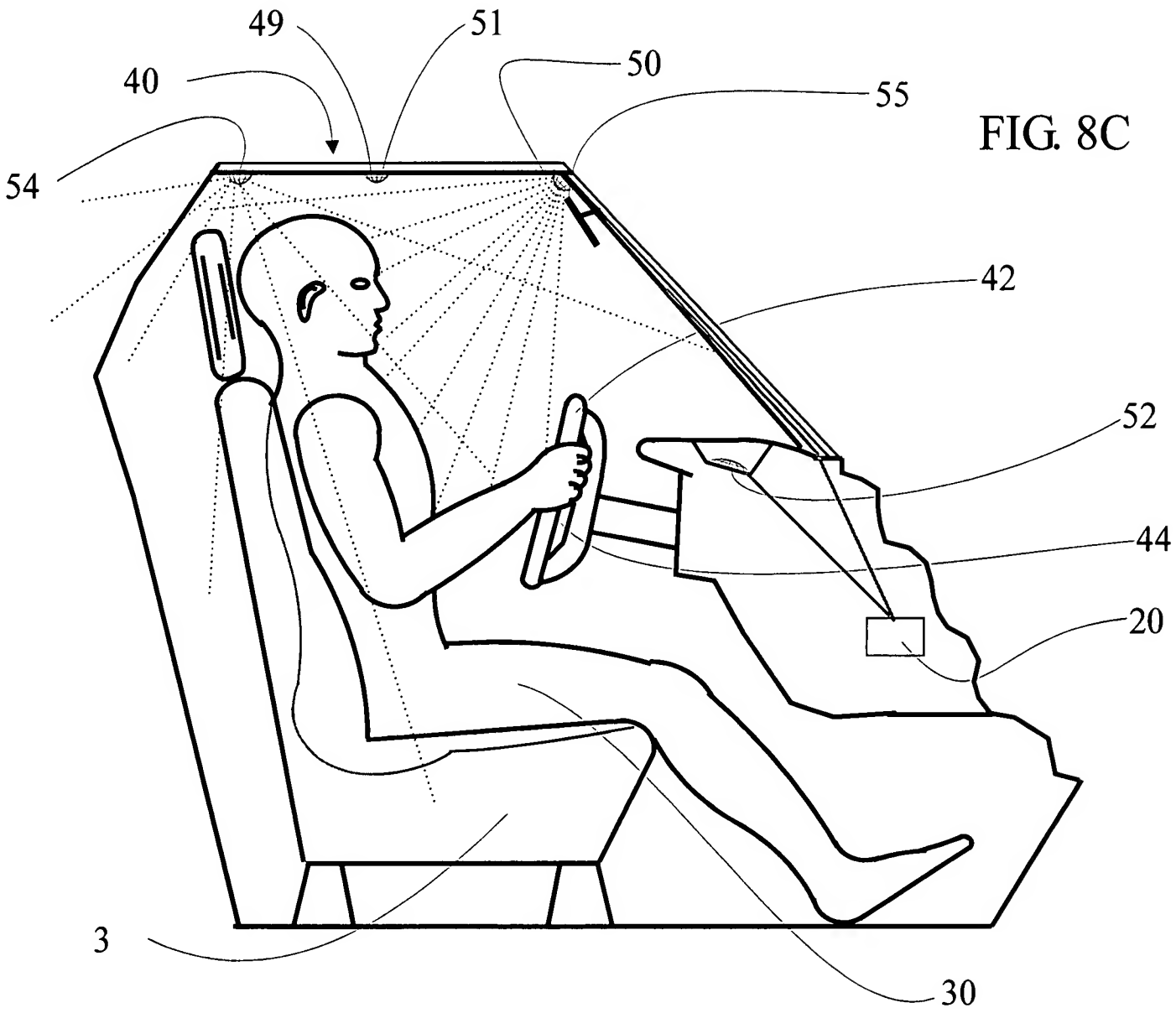


FIG. 8C

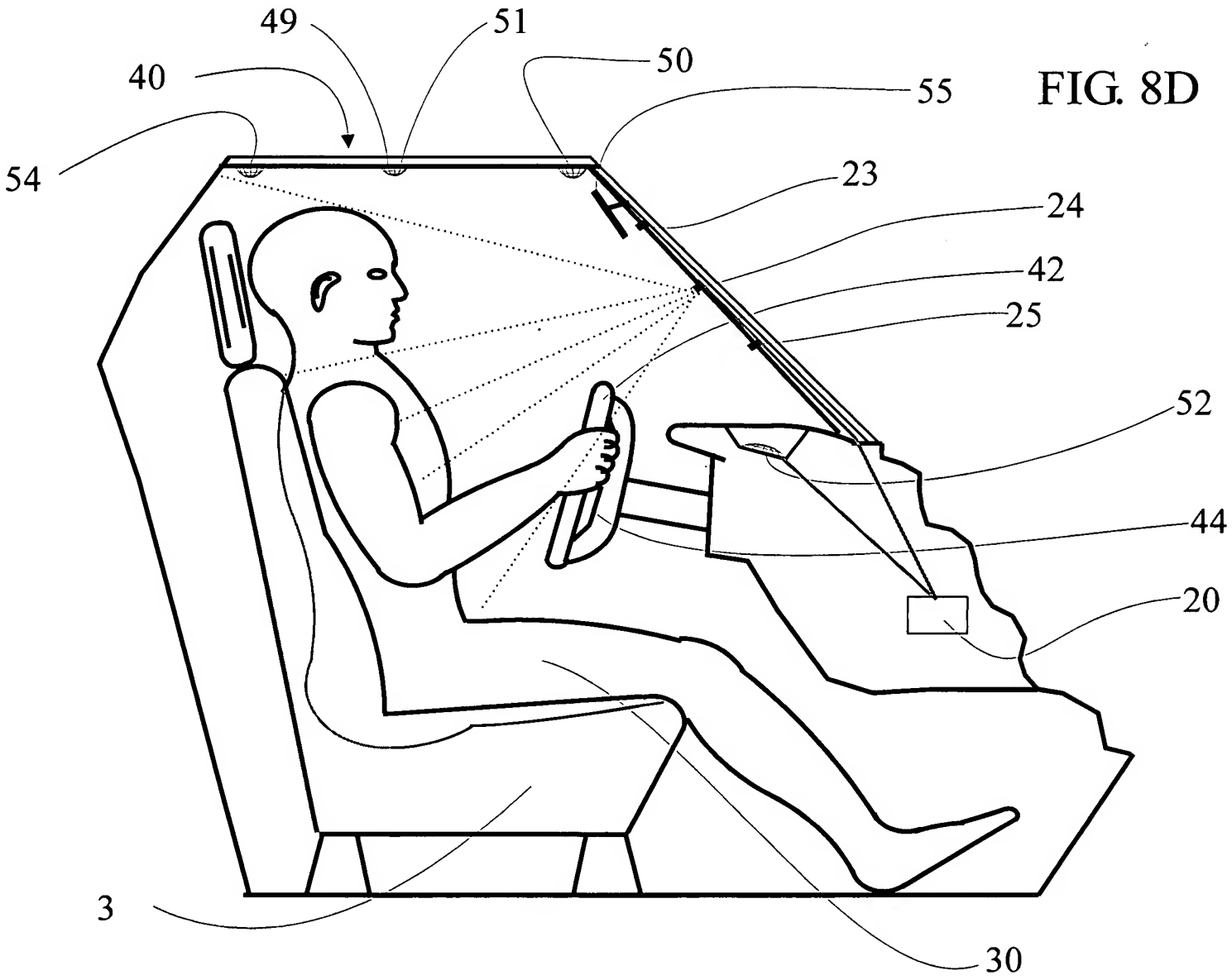


FIG. 8D

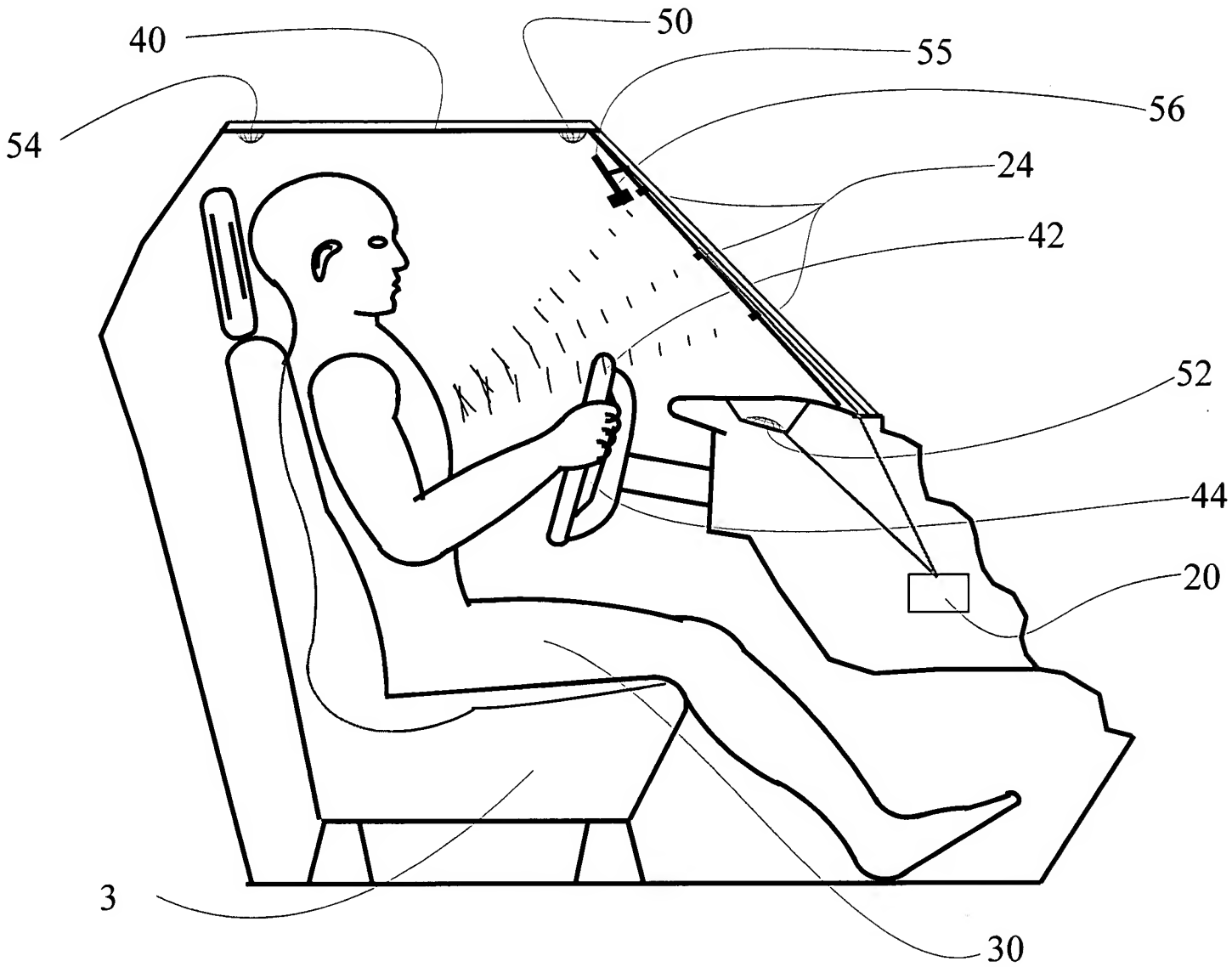


FIG. 8E

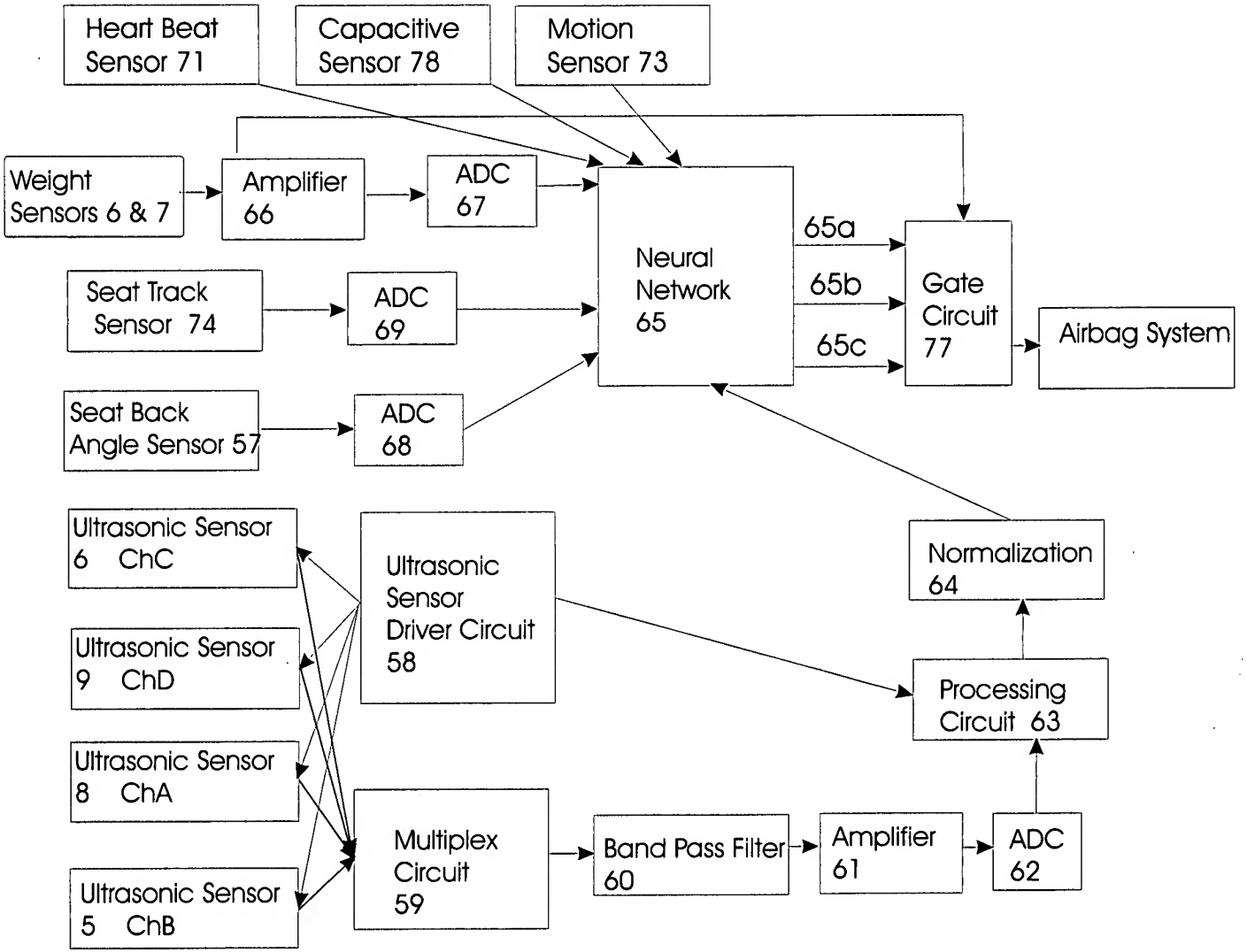
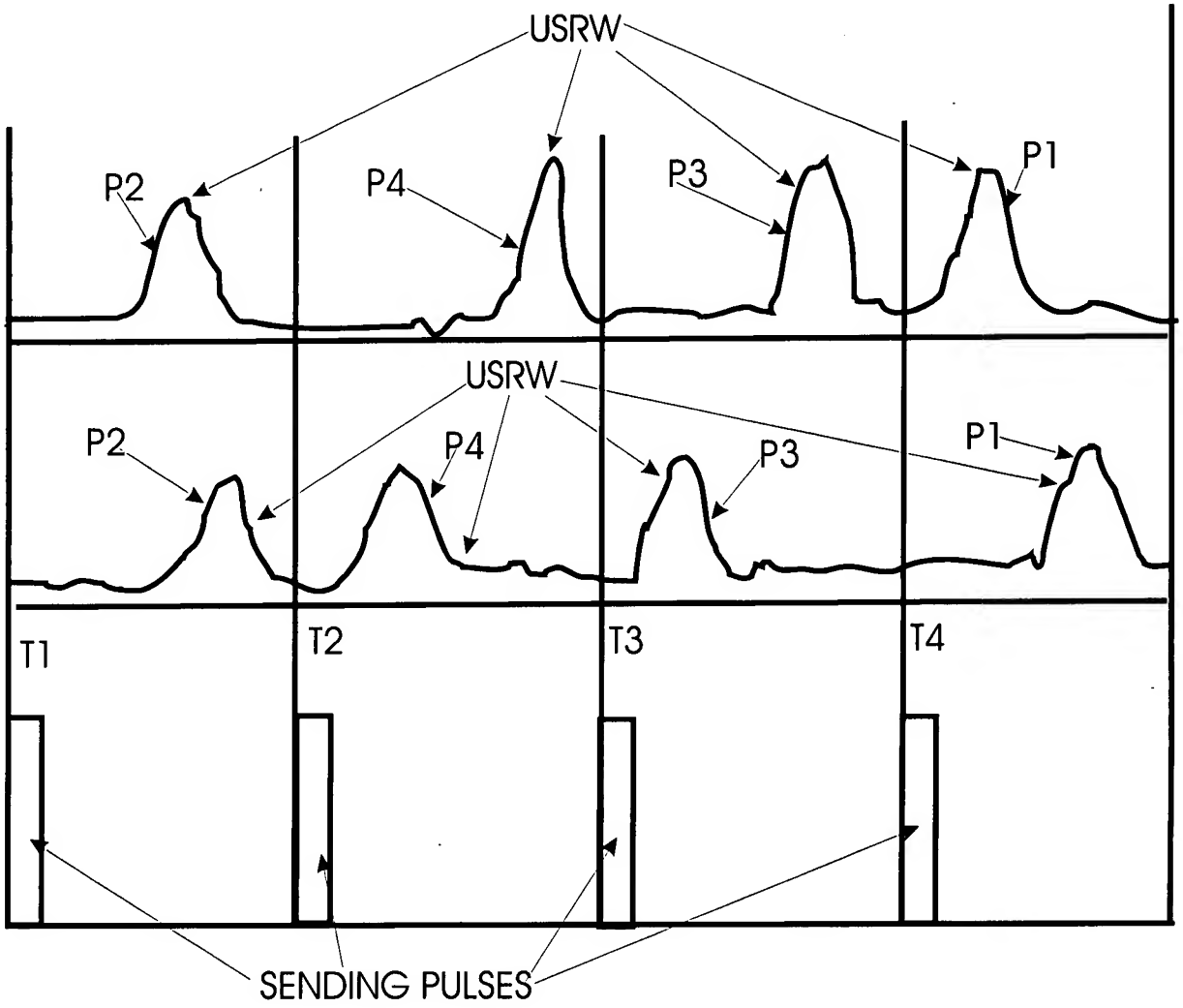

Heart Beat Sensor 71
Capacitive Sensor 78
Motion Sensor 73
Weight Sensors 6 & 7
Amplifier 66
ADC 67
Seat Track Sensor 74
ADC 69
Seat Back Angle Sensor 57
ADC 68
Neural Network 65
65a
65b
65c
Gate Circuit 77
Airbag System
Normalization 64
Ultrasonic Sensor 6 ChC
Ultrasonic Sensor 9 ChD
Ultrasonic Sensor 8 ChA
Ultrasonic Sensor 5 ChB
Ultrasonic Sensor Driver Circuit 58
Multiplex Circuit 59
Band Pass Filter 60
Amplifier 61
ADC 62
Processing Circuit 63

FIG. 9

FIG. 10(a)

FIG. 10(b)

FIG. 10(c)



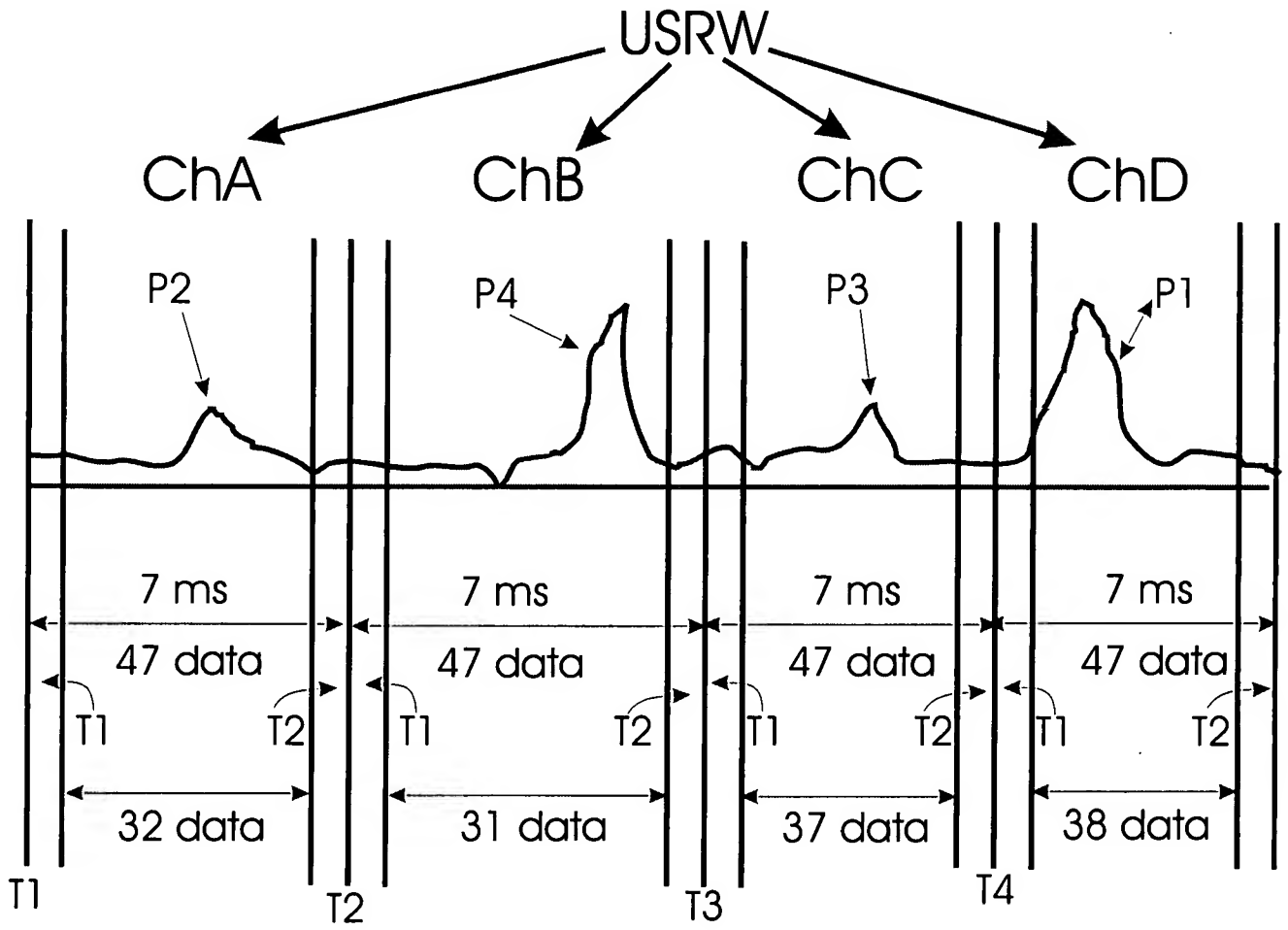

USRW
ChA
ChB
ChC
ChD
P2
P4
P3
P1
7 ms
47 data
T1
T2
32 data
31 data
37 data
38 data
T3
T4

FIG. 11

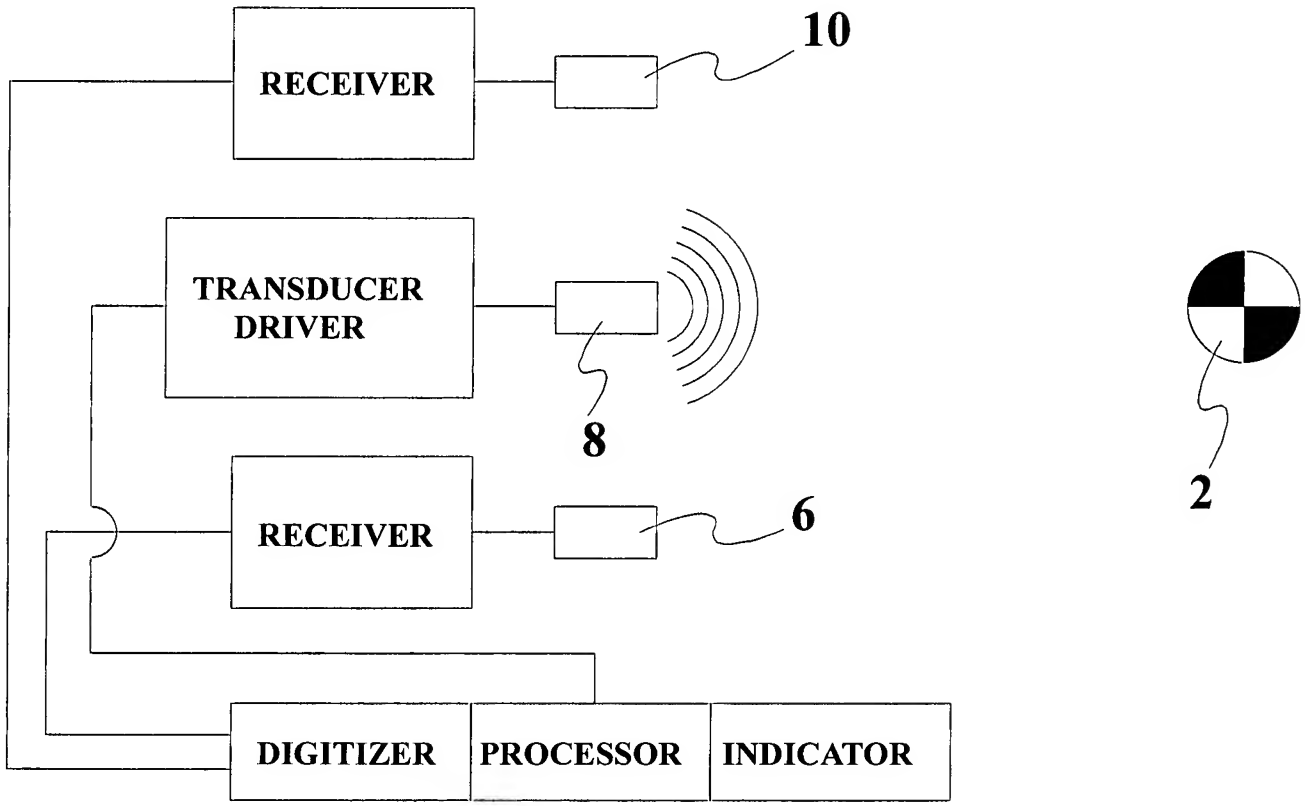

RECEIVER
10
TRANSDUCER DRIVER
8
RECEIVER
6
DIGITIZER
PROCESSOR
INDICATOR
2

FIG. 12A

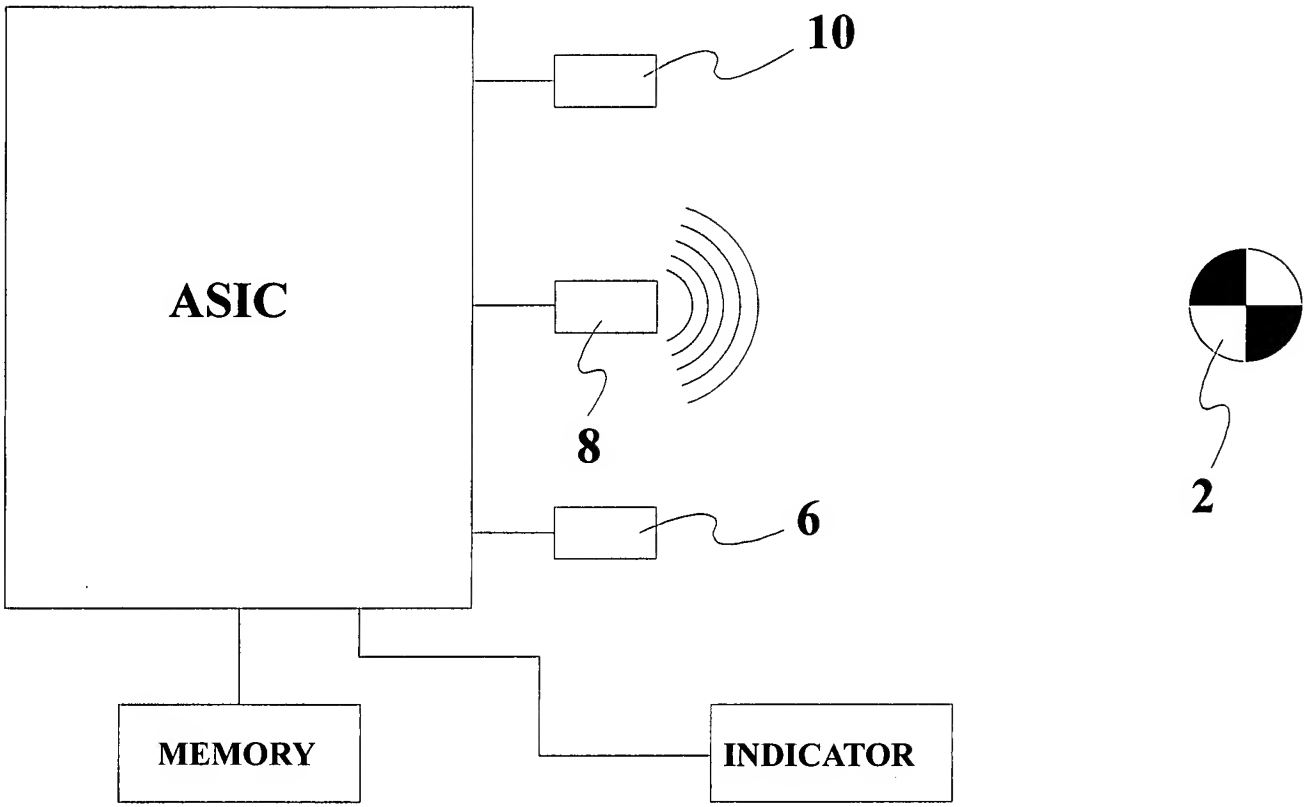


FIG. 12B

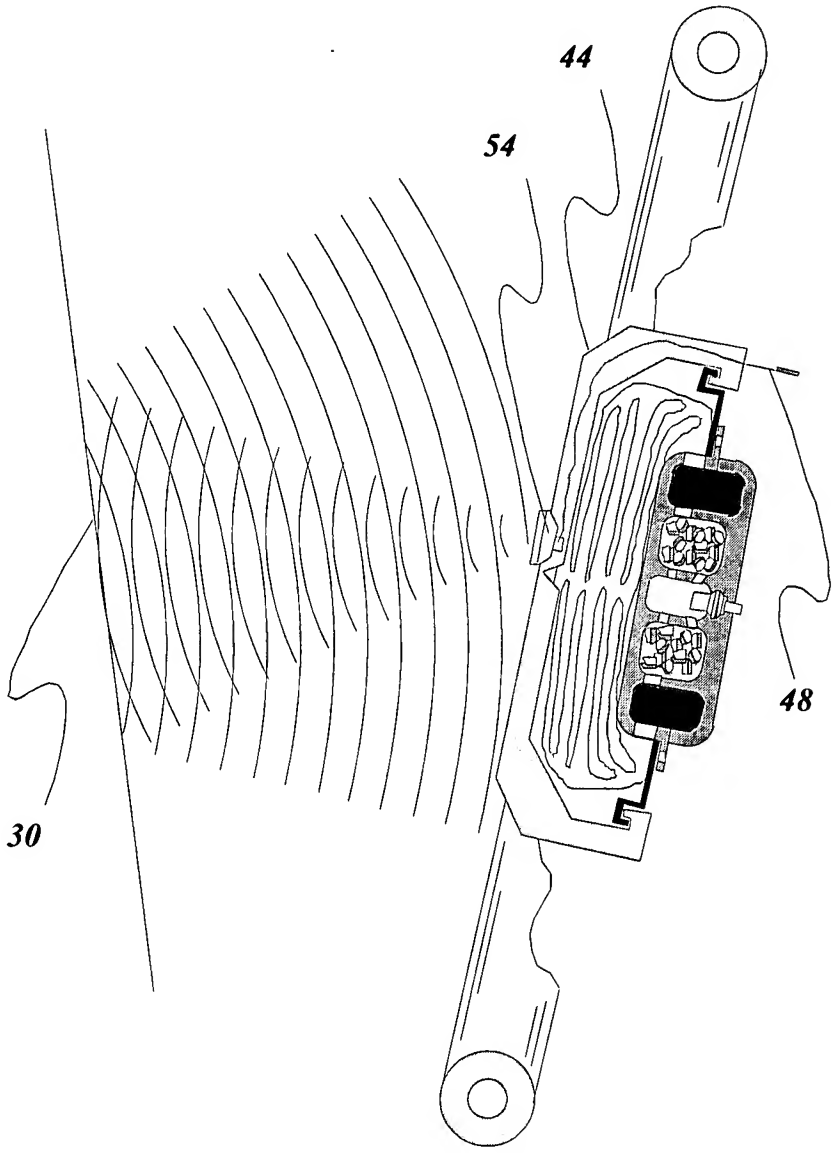


FIG. 13

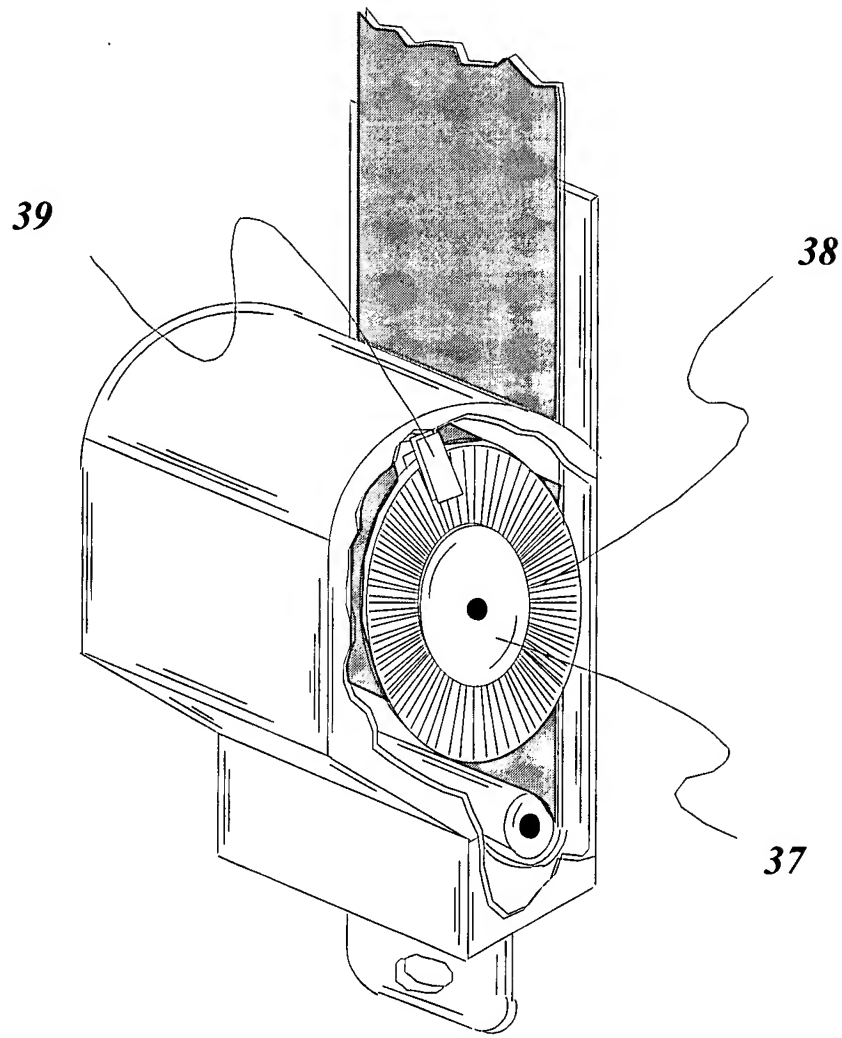


FIG. 14

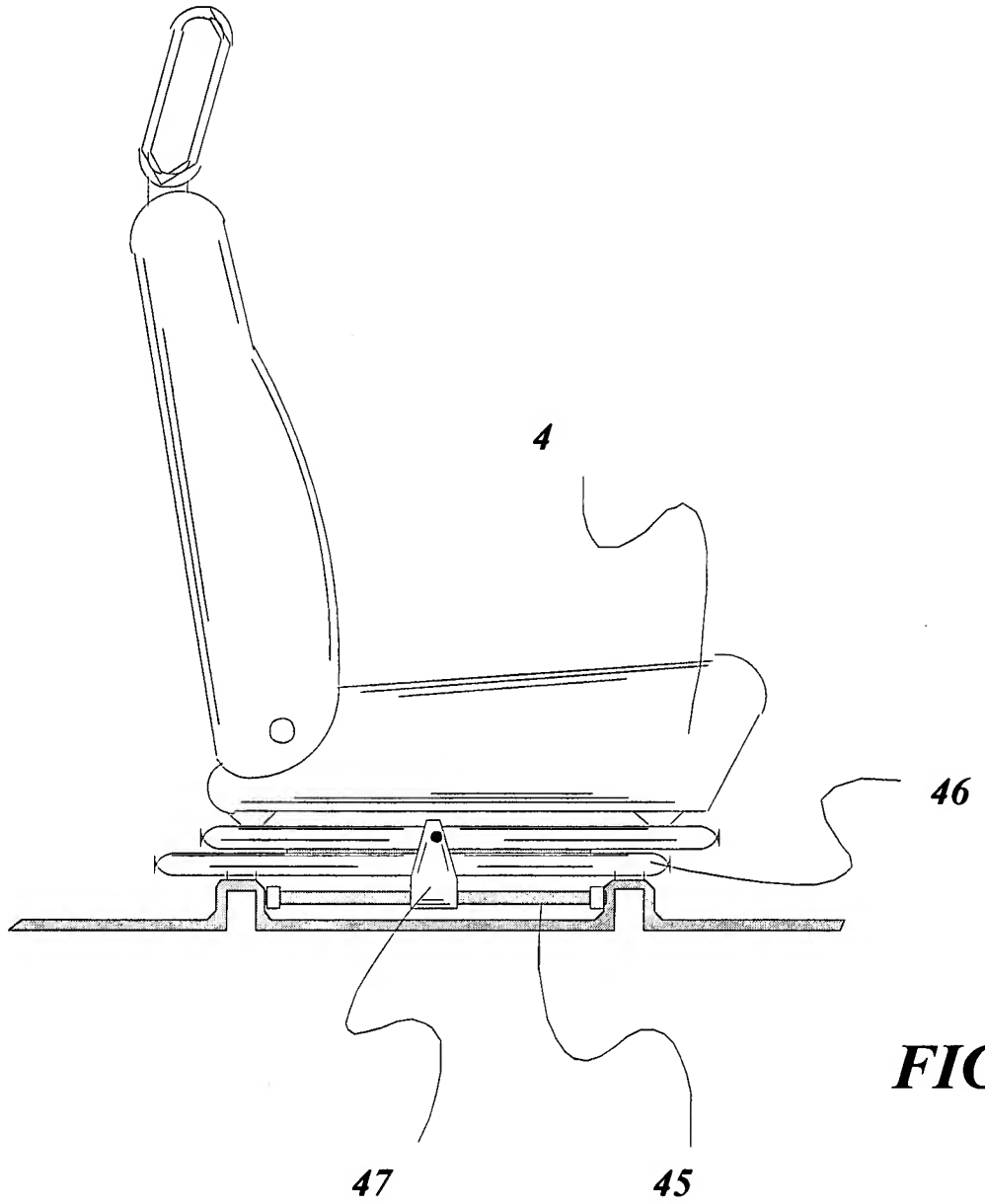


FIG. 15

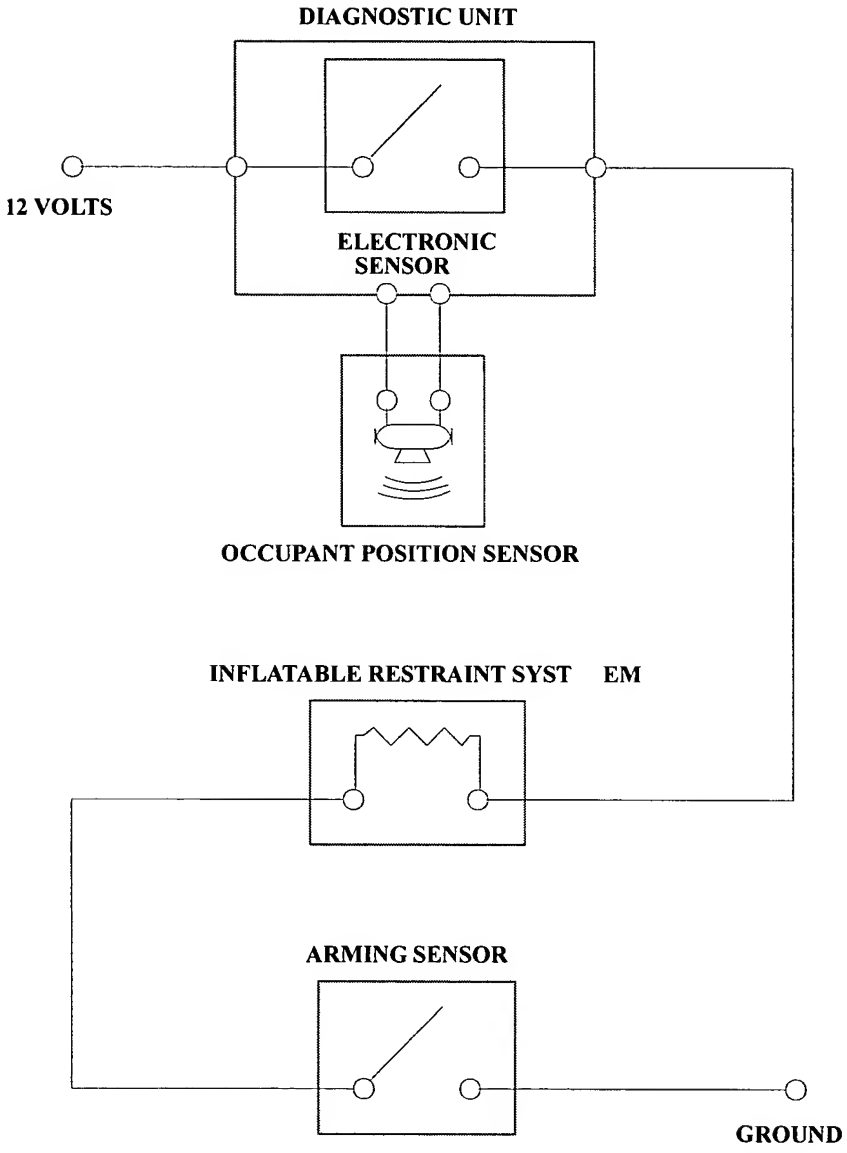

DIAGNOSTIC UNIT
12 VOLTS
ELECTRONIC SENSOR
OCCUPANT POSITION SENSOR
INFLATABLE RESTRAINT SYST EM
ARMING SENSOR
GROUND

FIG. 16

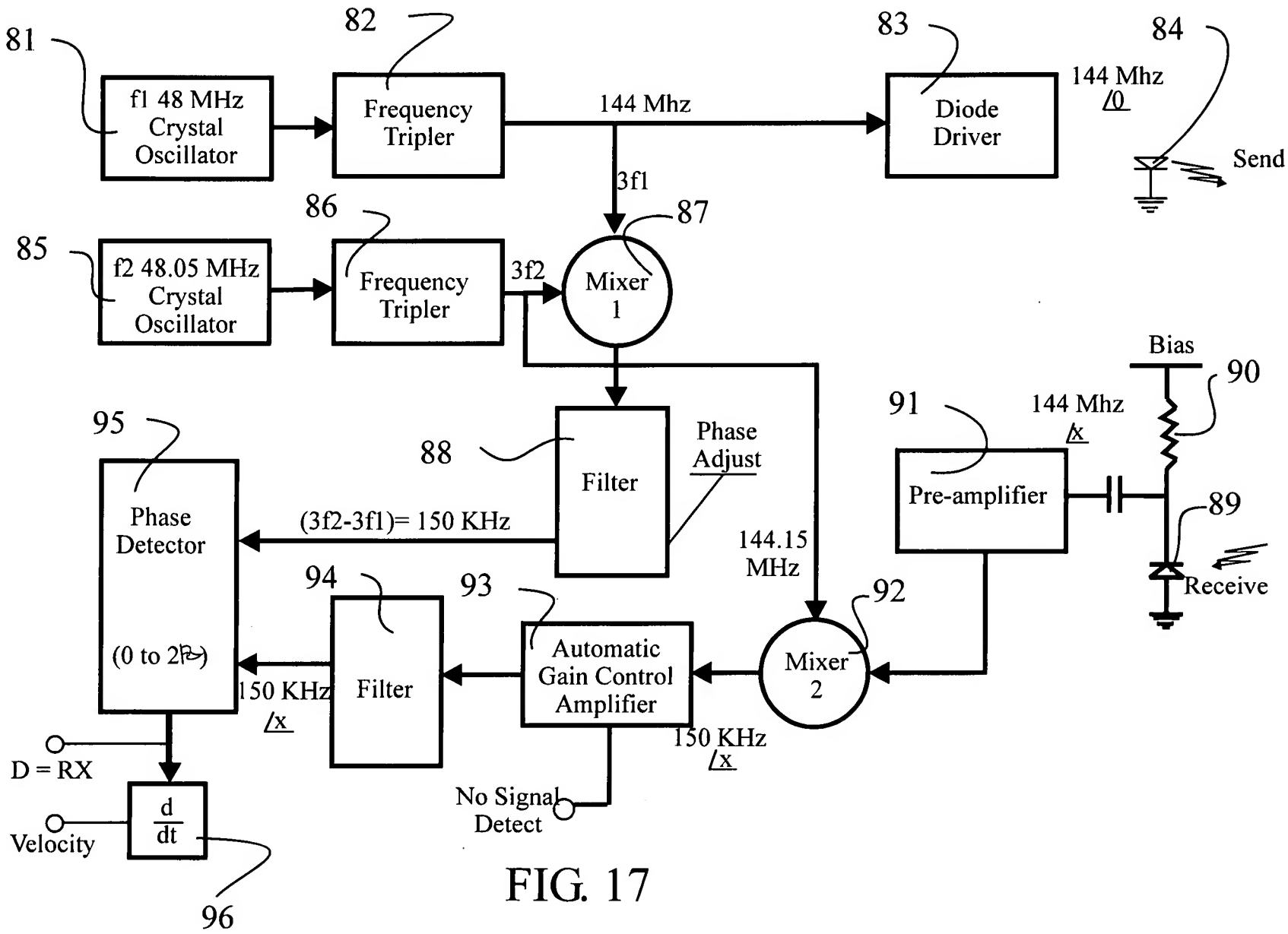

81
f1 48 MHz Crystal Oscillator
82
Frequency Tripler
144 Mhz
83
Diode Driver
84
144 Mhz
Send
3f1
86
87
85
f2 48.05 MHz Crystal Oscillator
Frequency Tripler
3f2
Mixer 1
Bias
90
91
144 Mhz
95
88
Filter
Phase Adjust
Pre-amplifier
89
Phase Detector
(3f2-3f1)= 150 KHz
144.15 MHz
Receive
94
93
92
Automatic Gain Control Amplifier
Mixer 2
(0 to 2π)
150 KHz
Filter
150 KHz
D = RX
No Signal Detect
Velocity
d/dt
96

FIG. 17

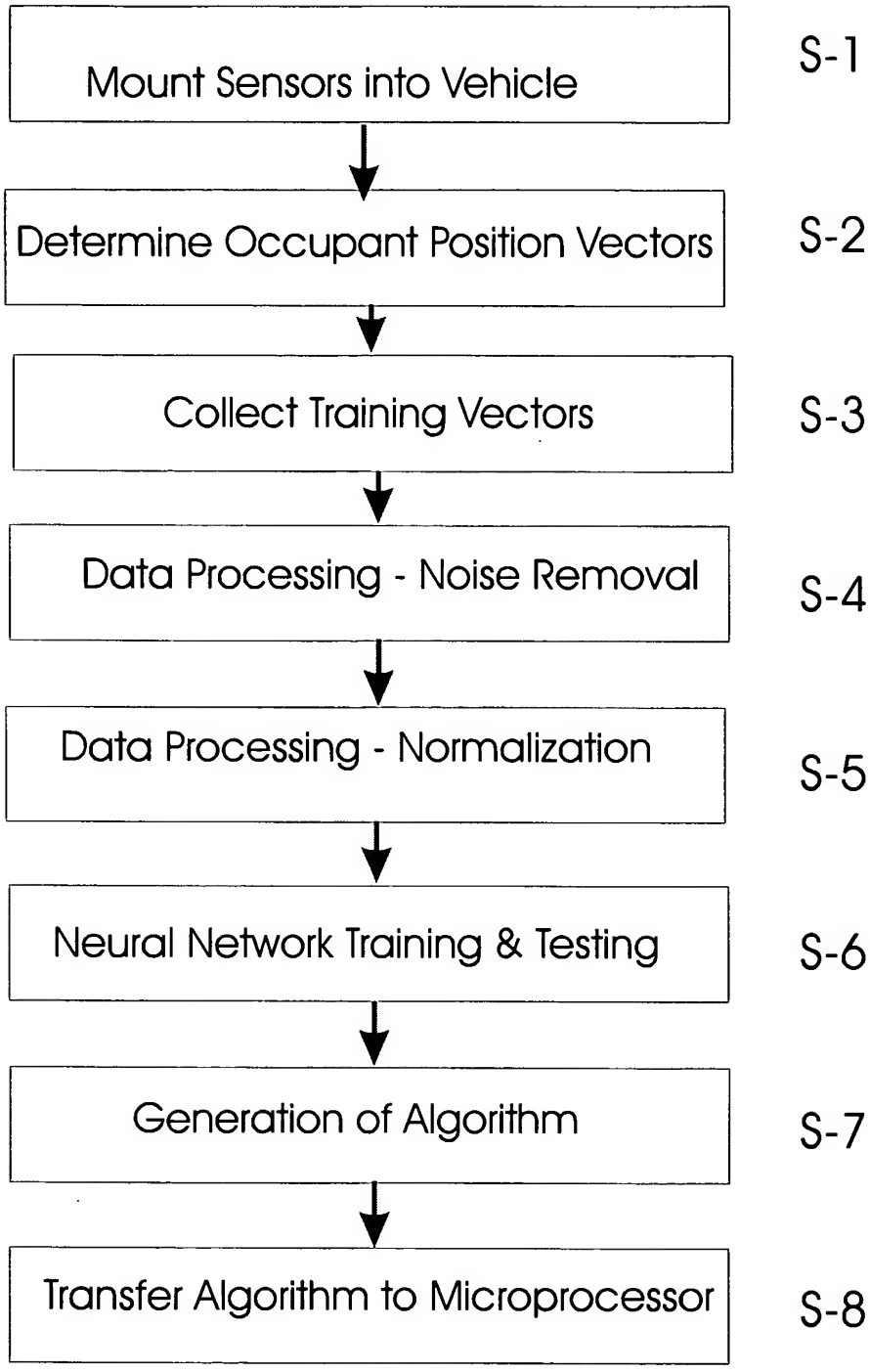

Mount Sensors into Vehicle
S-1
Determine Occupant Position Vectors
S-2
Collect Training Vectors
S-3
Data Processing - Noise Removal
S-4
Data Processing - Normalization
S-5
Neural Network Training & Testing
S-6
Generation of Algorithm
S-7
Transfer Algorithm to Microprocessor
S-8

FIG. 18

FIG. 19a

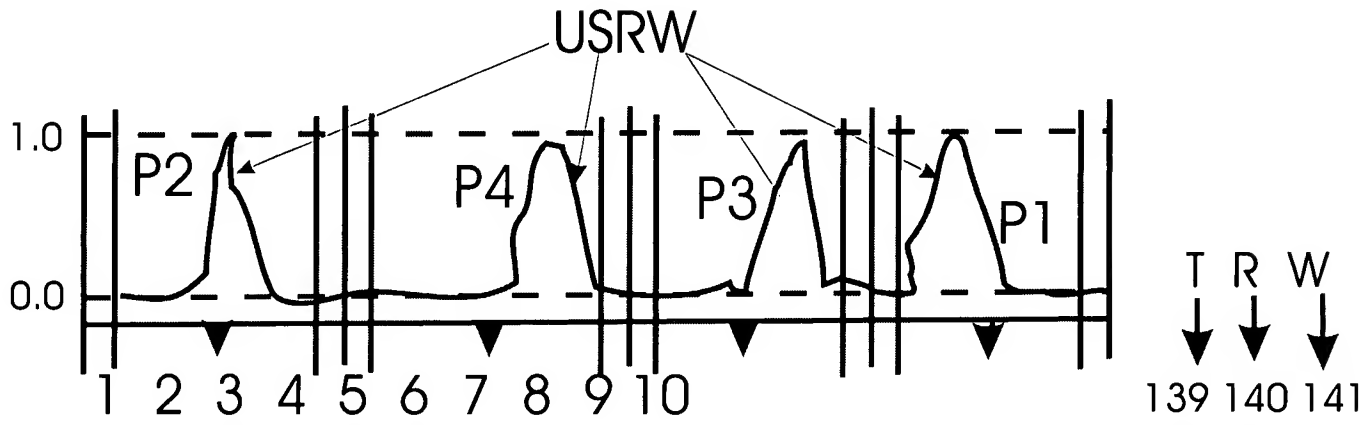
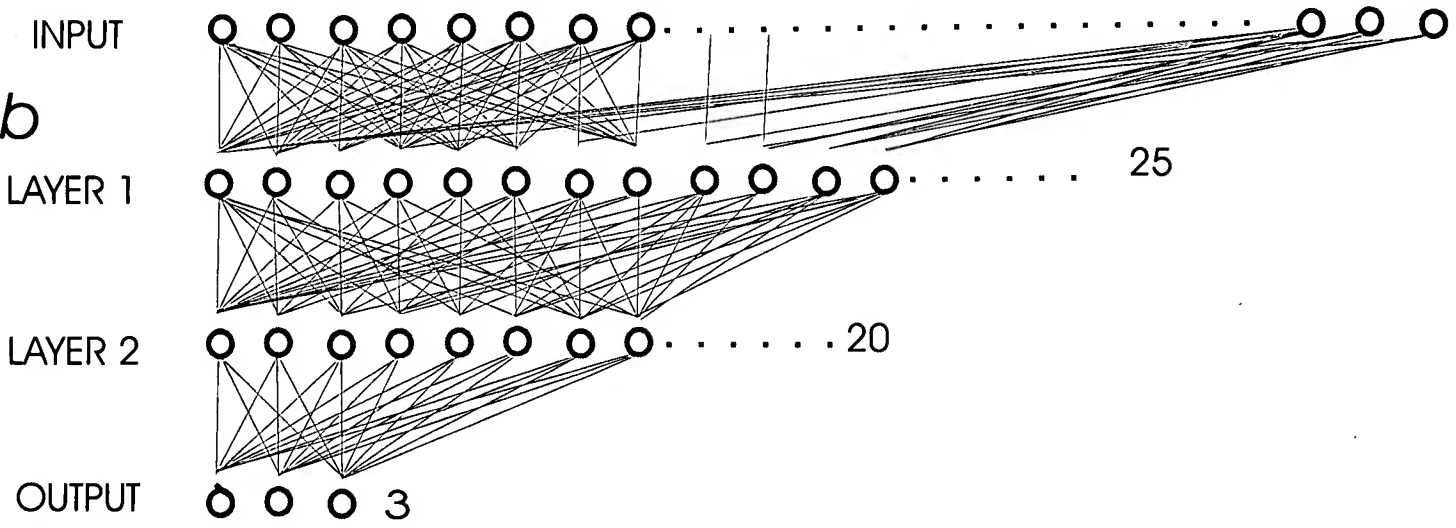


FIG. 19b



1 0 0 FFH or FFCS
0 1 0 RFCS or OOPH
0 0 1 VACANT

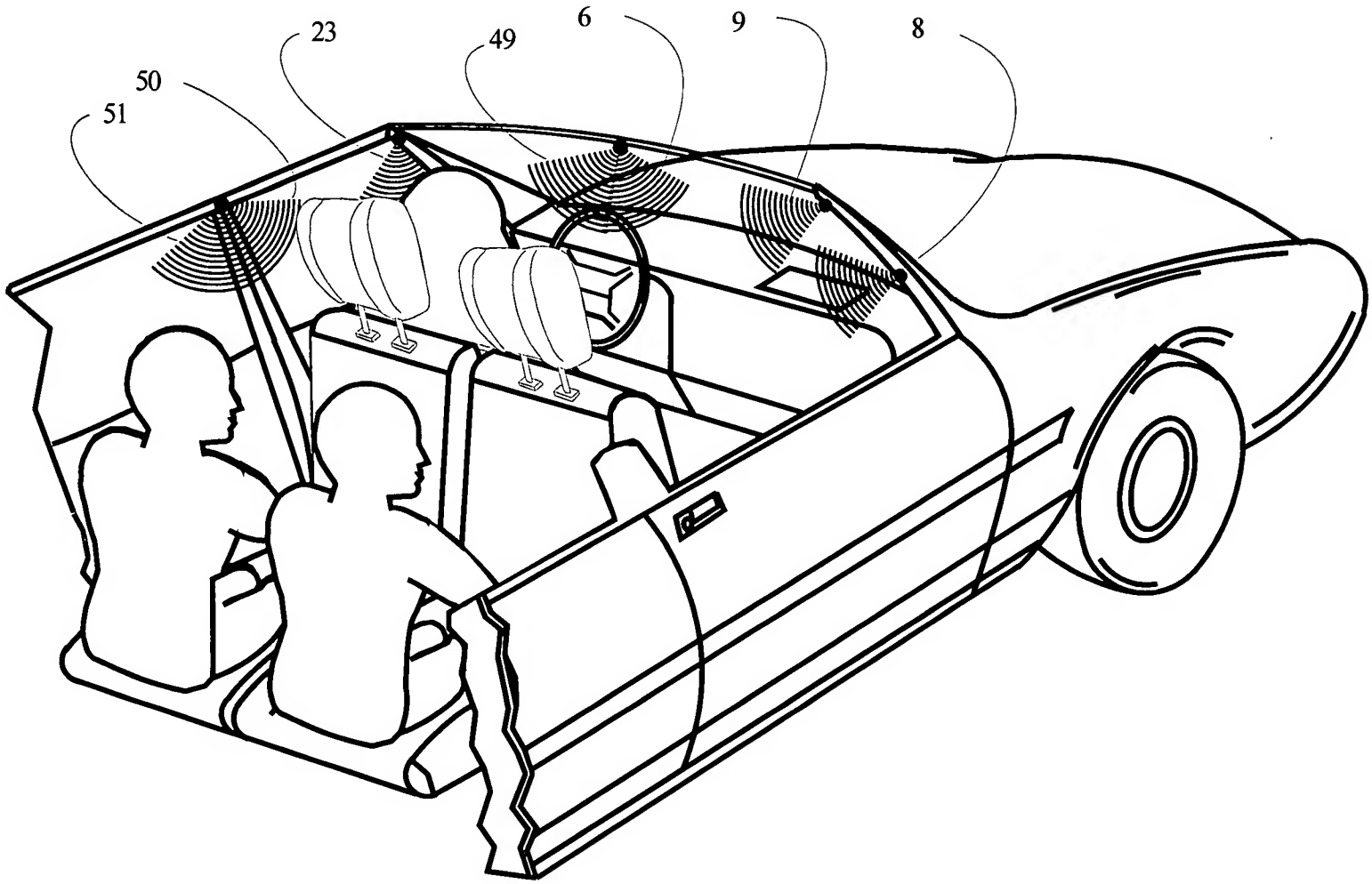


FIG. 20

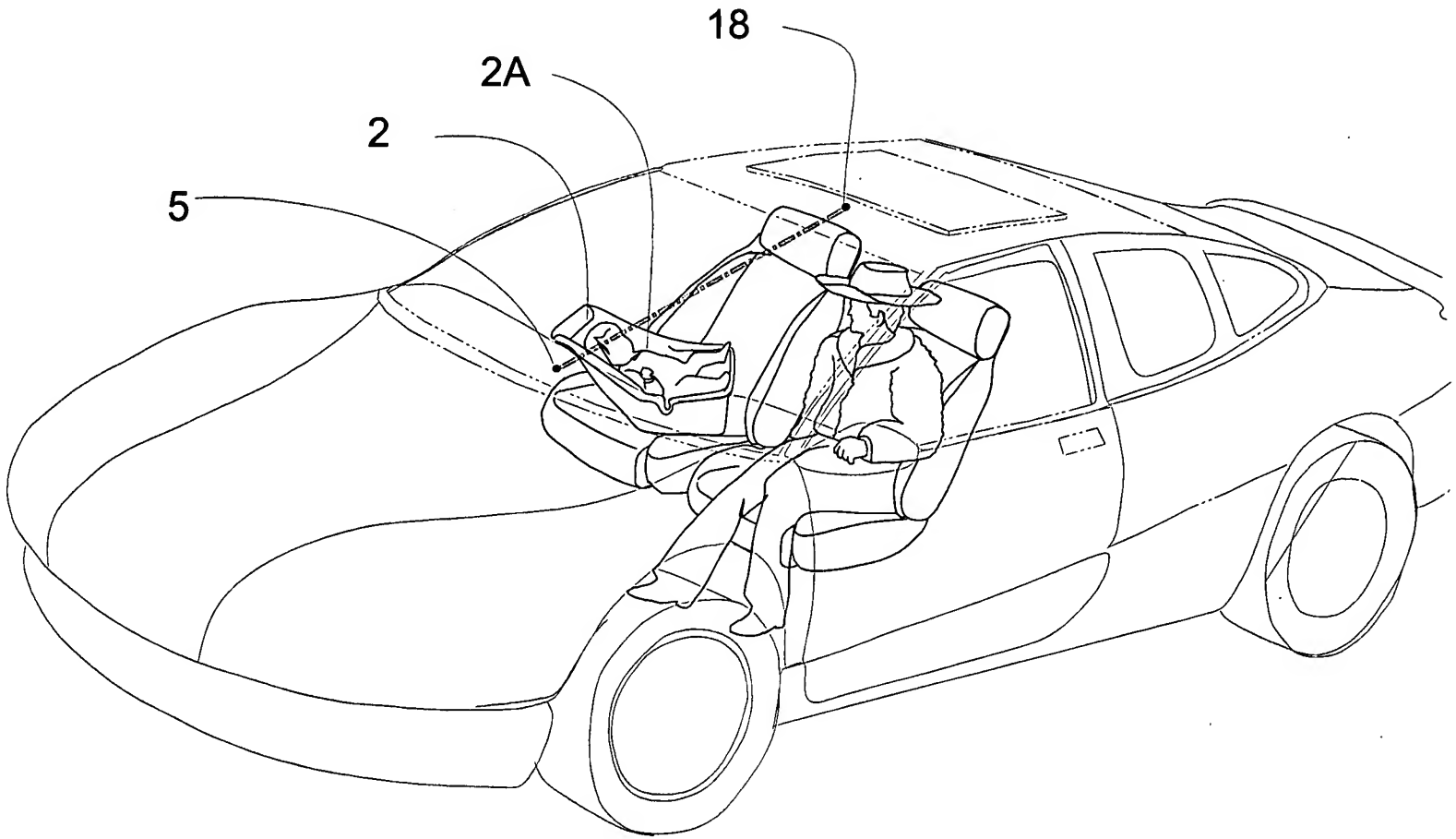


FIG. 21

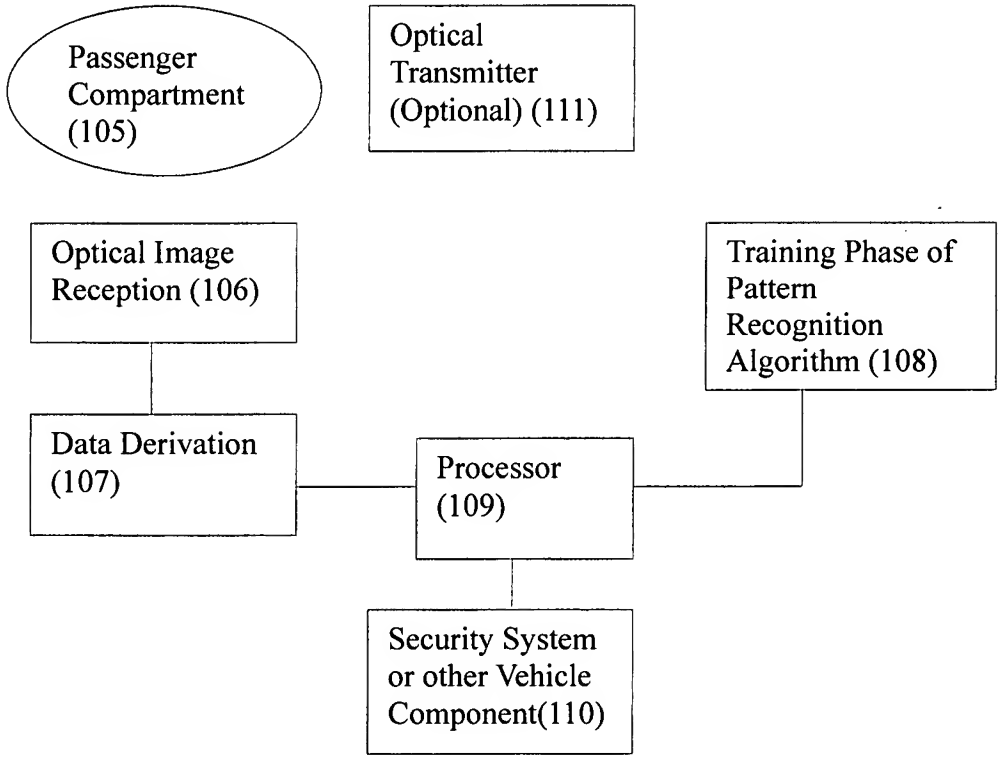

Passenger Compartment (105)
Optical Transmitter (Optional) (111)
Optical Image Reception (106)
Training Phase of Pattern Recognition Algorithm (108)
Data Derivation (107)
Processor (109)
Security System or other Vehicle Component(110)

FIG. 22

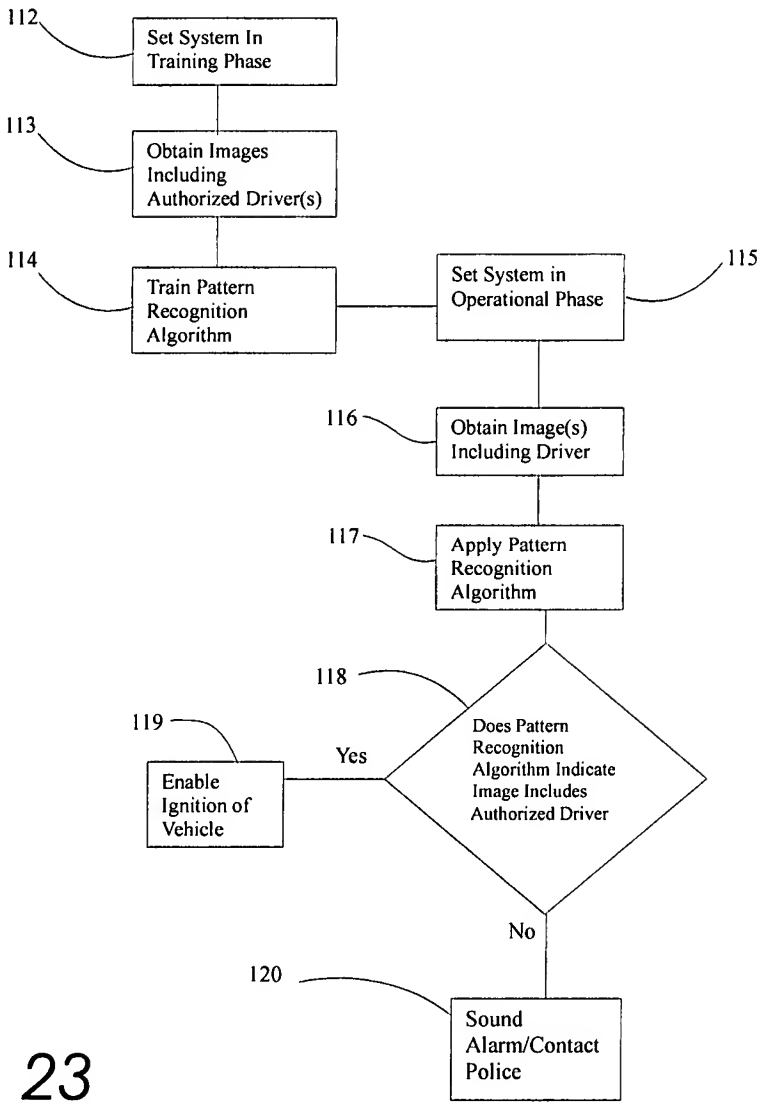

112
Set System In Training Phase
113
Obtain Images Including Authorized Driver(s)
114
Train Pattern Recognition Algorithm
115
Set System in Operational Phase
116
Obtain Image(s) Including Driver
117
Apply Pattern Recognition Algorithm
118
Does Pattern Recognition Algorithm Indicate Image Includes Authorized Driver
Yes
119
Enable Ignition of Vehicle
No
120
Sound Alarm/Contact Police

FIG. 23

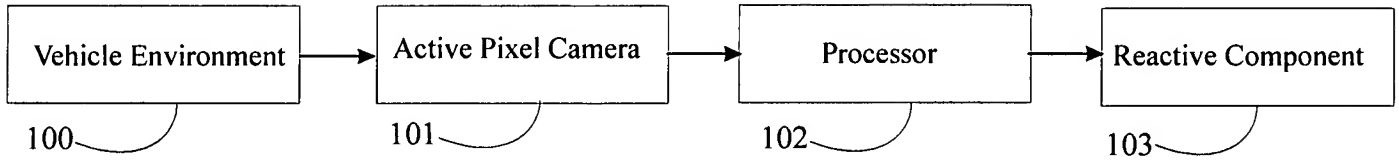

Vehicle Environment
Active Pixel Camera
Processor
Reactive Component
100
101
102
103

FIG. 24

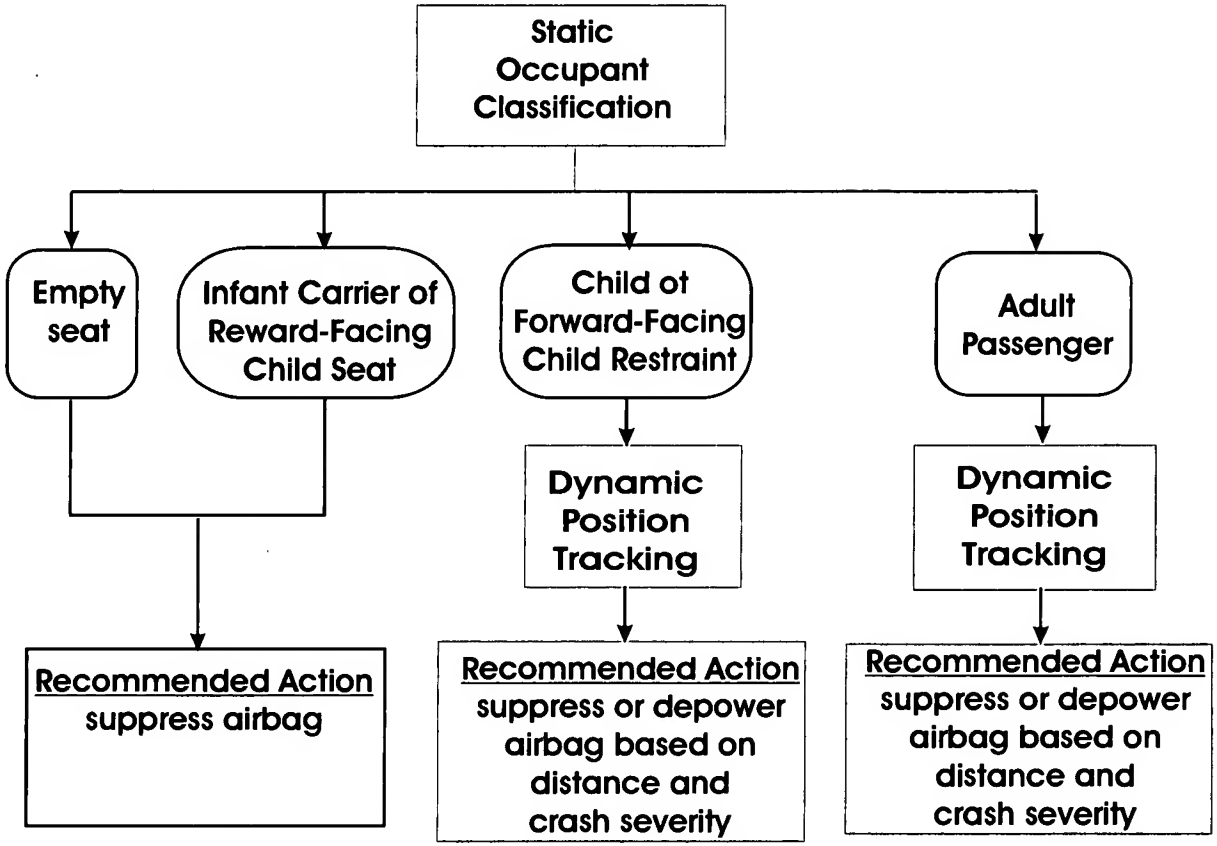

Static Occupant Classification
Empty seat
Infant Carrier of Reward-Facing Child Seat
Child ot Forward-Facing Child Restraint
Adult Passenger
Dynamic Position Tracking
Dynamic Position Tracking
Recommended Action suppress airbag
Recommended Action suppress or depower airbag based on distance and crash severity
Recommended Action suppress or depower airbag based on distance and crash severity

FIG. 25

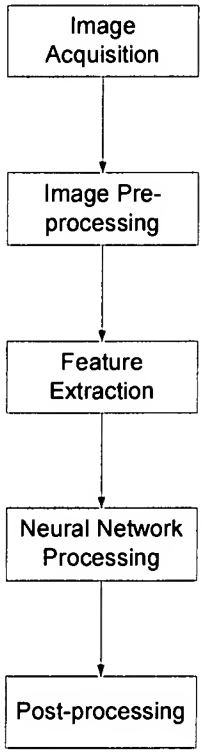


Image Acquisition
Image Pre-processing
Feature Extraction
Neural Network Processing
Post-processing

FIG. 26

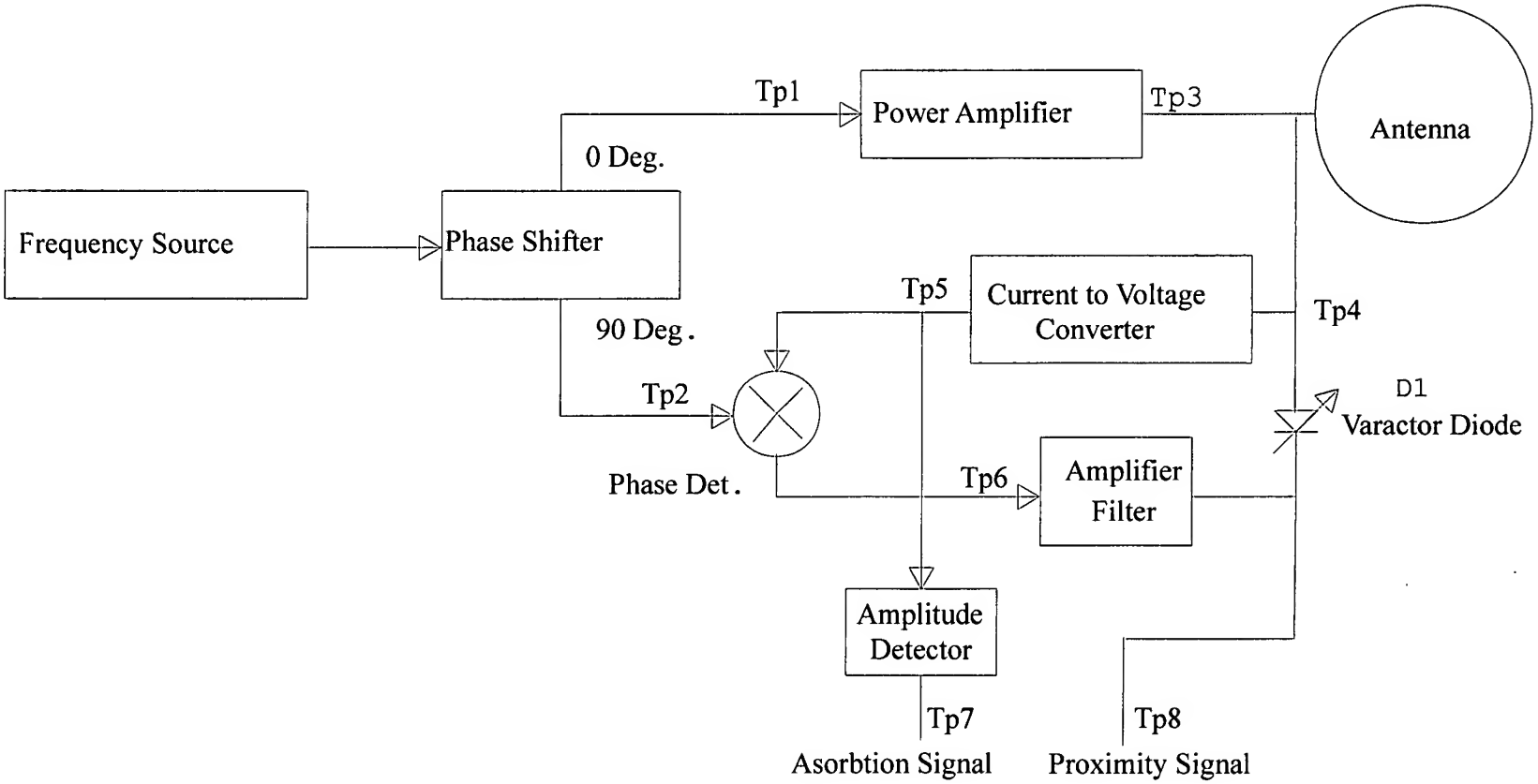

Tp1
Power Amplifier
Tp3
Antenna
0 Deg.
Frequency Source
Phase Shifter
Tp5
Current to Voltage Converter
Tp4
90 Deg.
Tp2
D1
Varactor Diode
Phase Det.
Tp6
Amplifier Filter
Amplitude Detector
Tp7
Asorbtion Signal
Tp8
Proximity Signal

Fig. 27

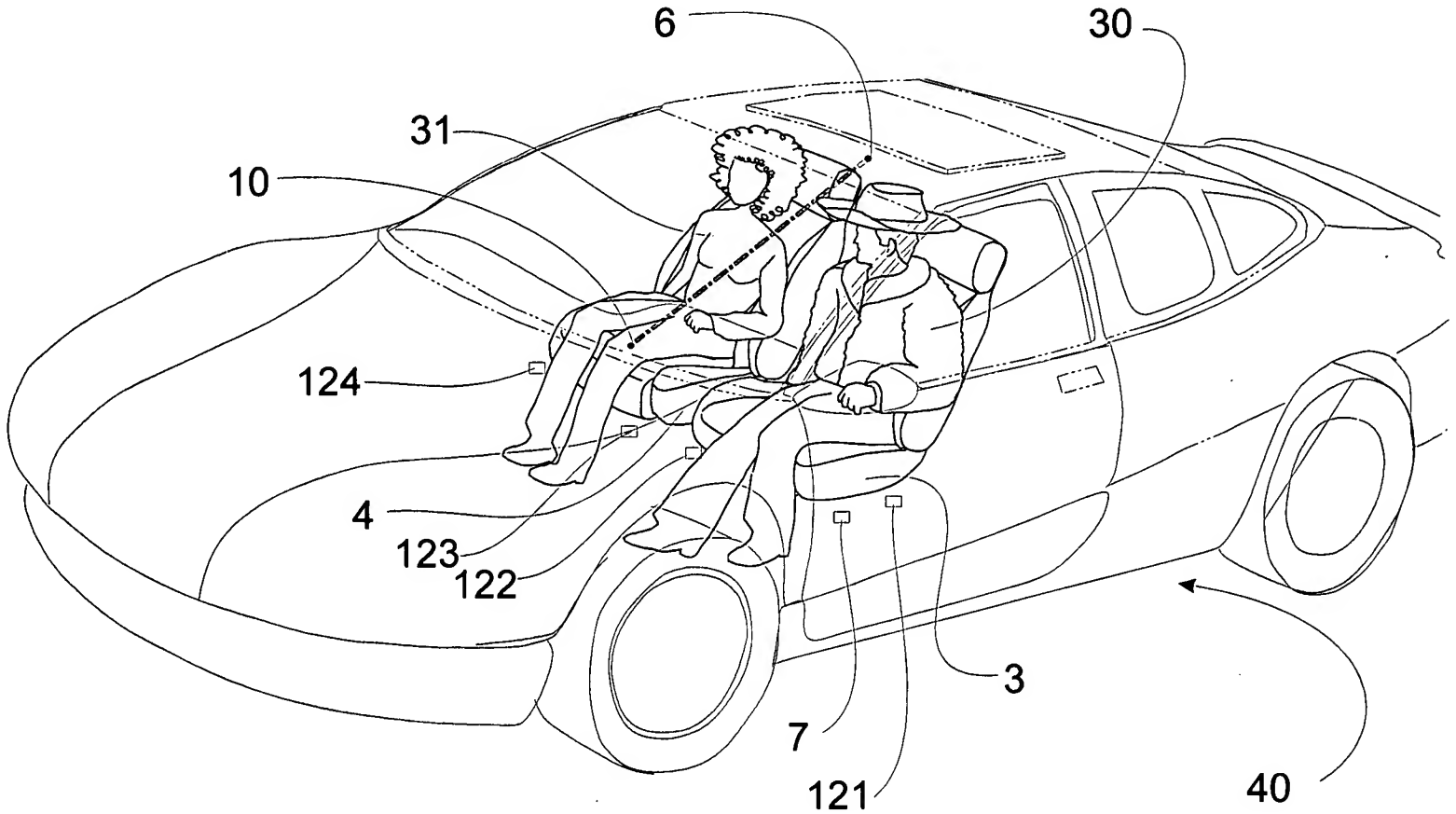


FIG. 28

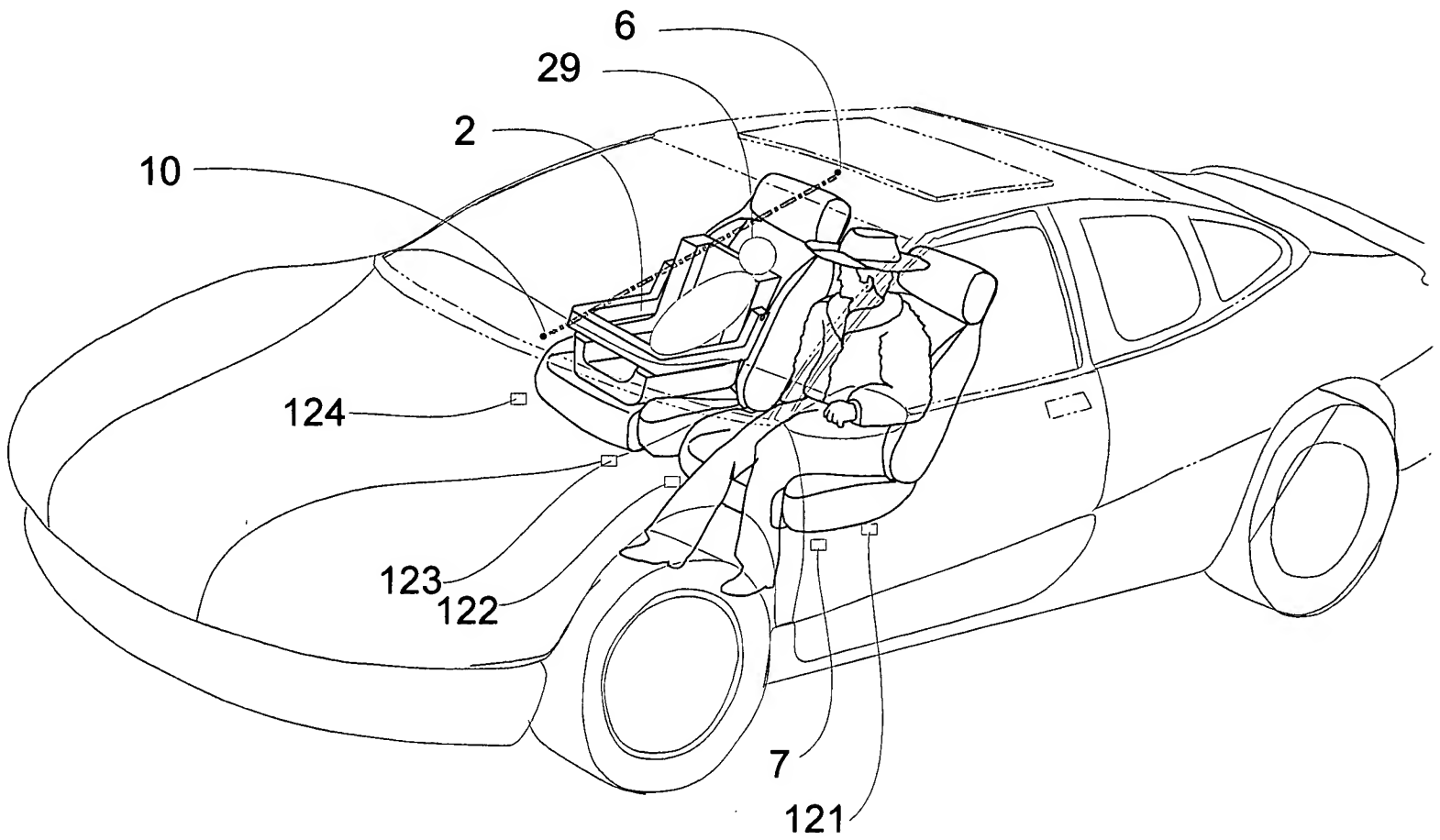


FIG. 29

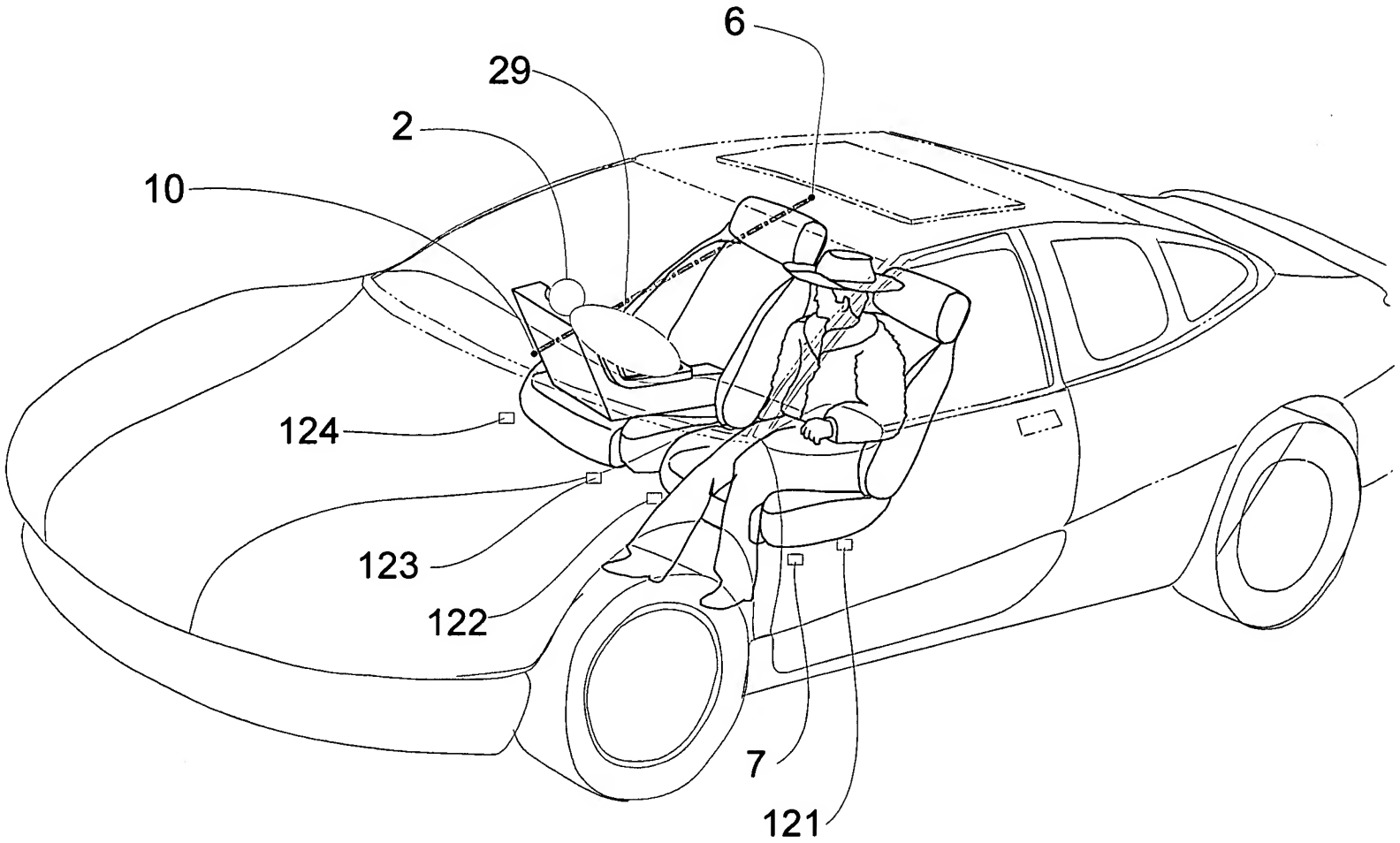


FIG. 30

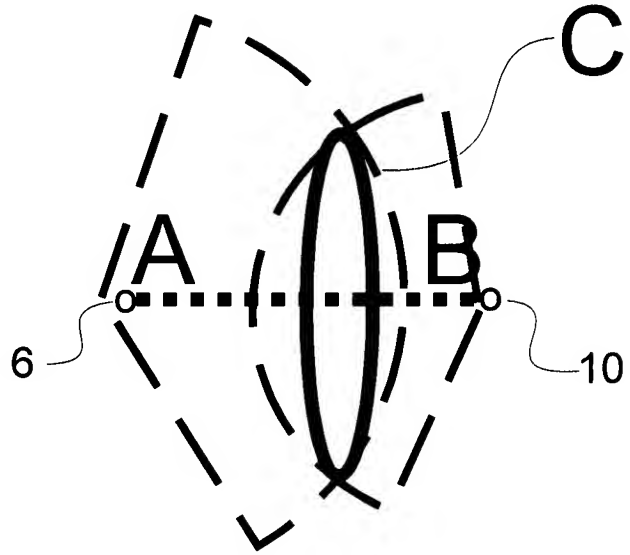


FIG. 31

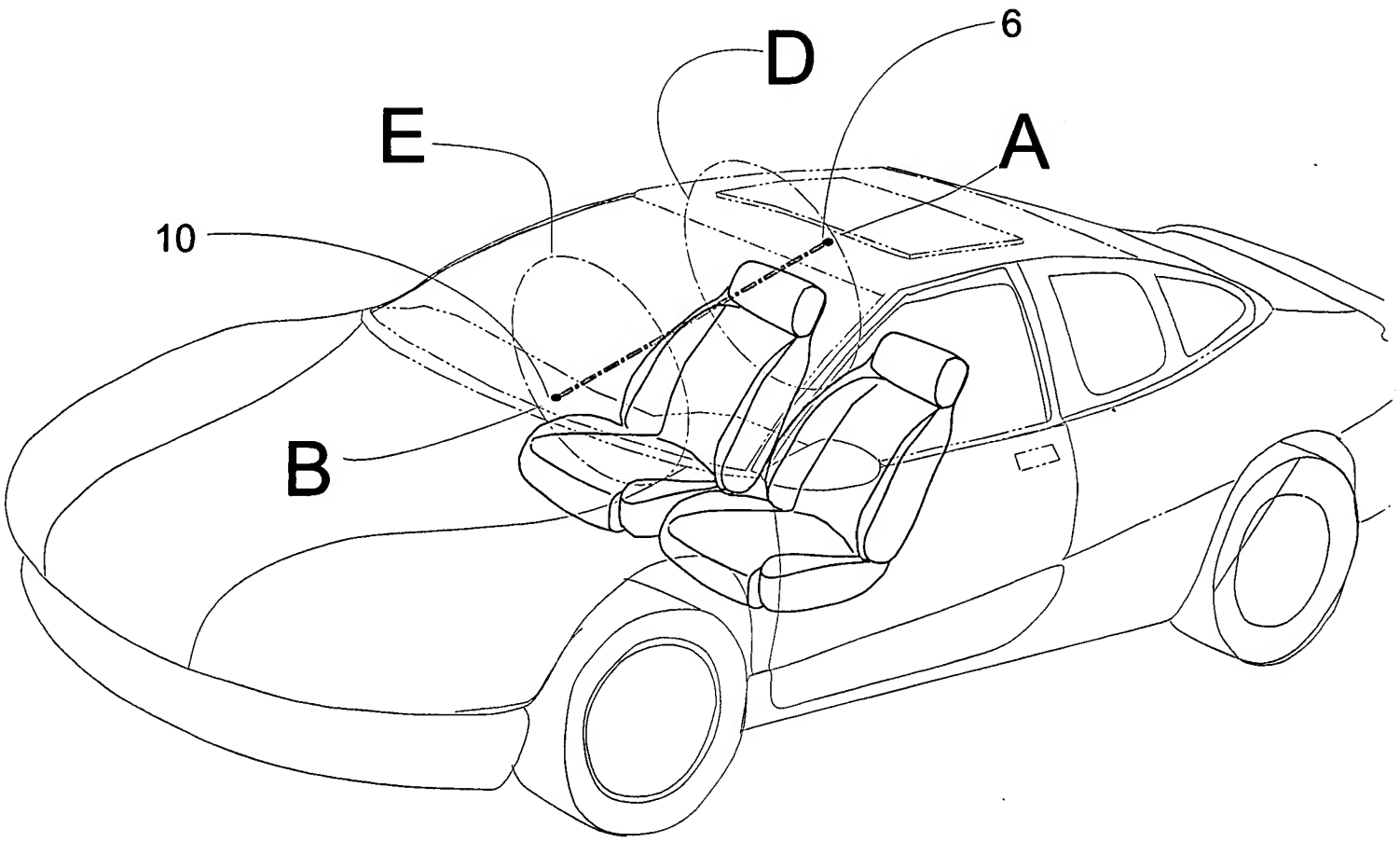


FIG. 32

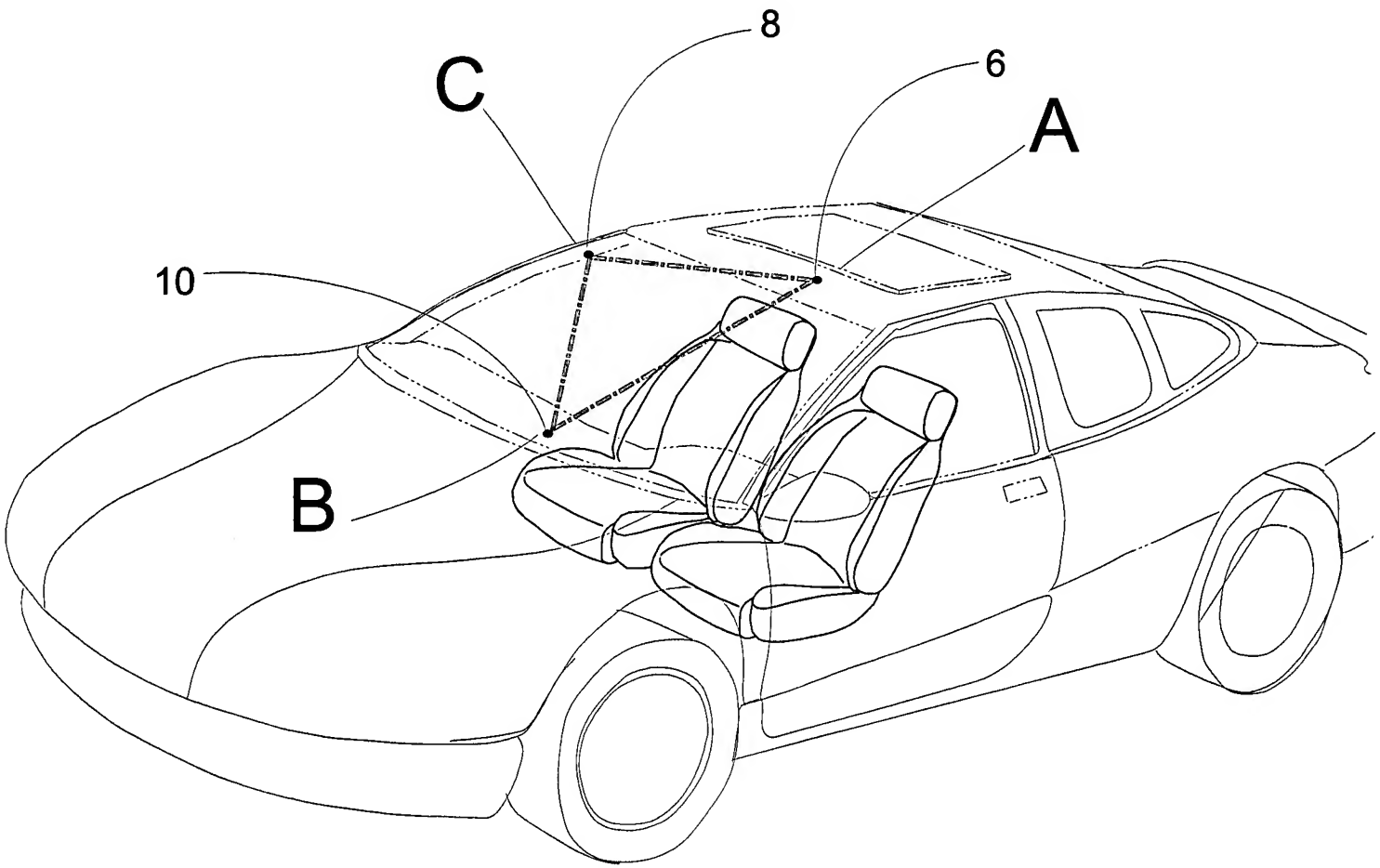


FIG. 33

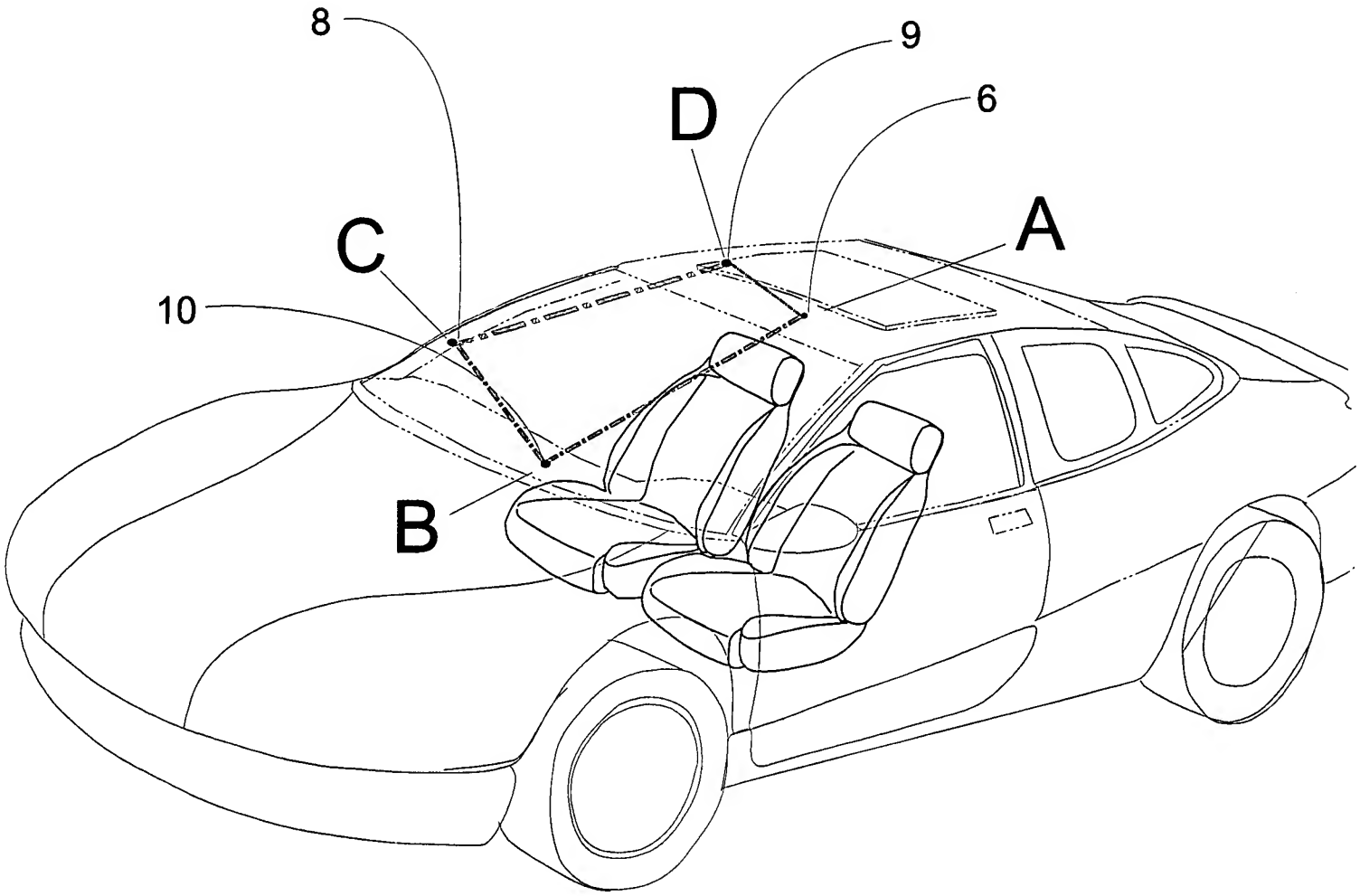


FIG. 34

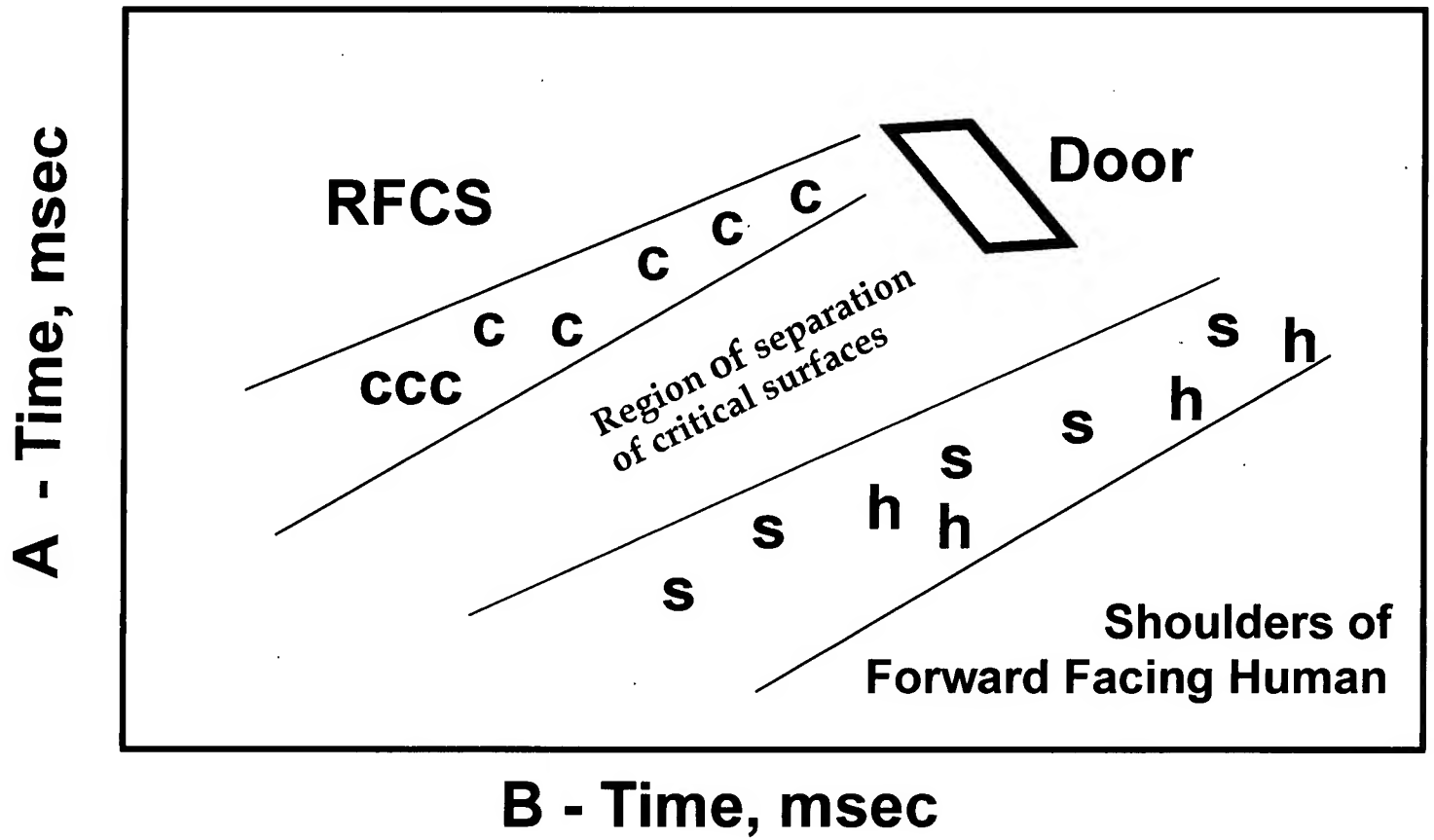

A - Time, msec
RFCS
Door
c
c
c
c
c
ccc
Region of separation
of critical surfaces
s
h
s
h
s
h
s
s
h
Shoulders of
Forward Facing Human
B - Time, msec

FIG. 35

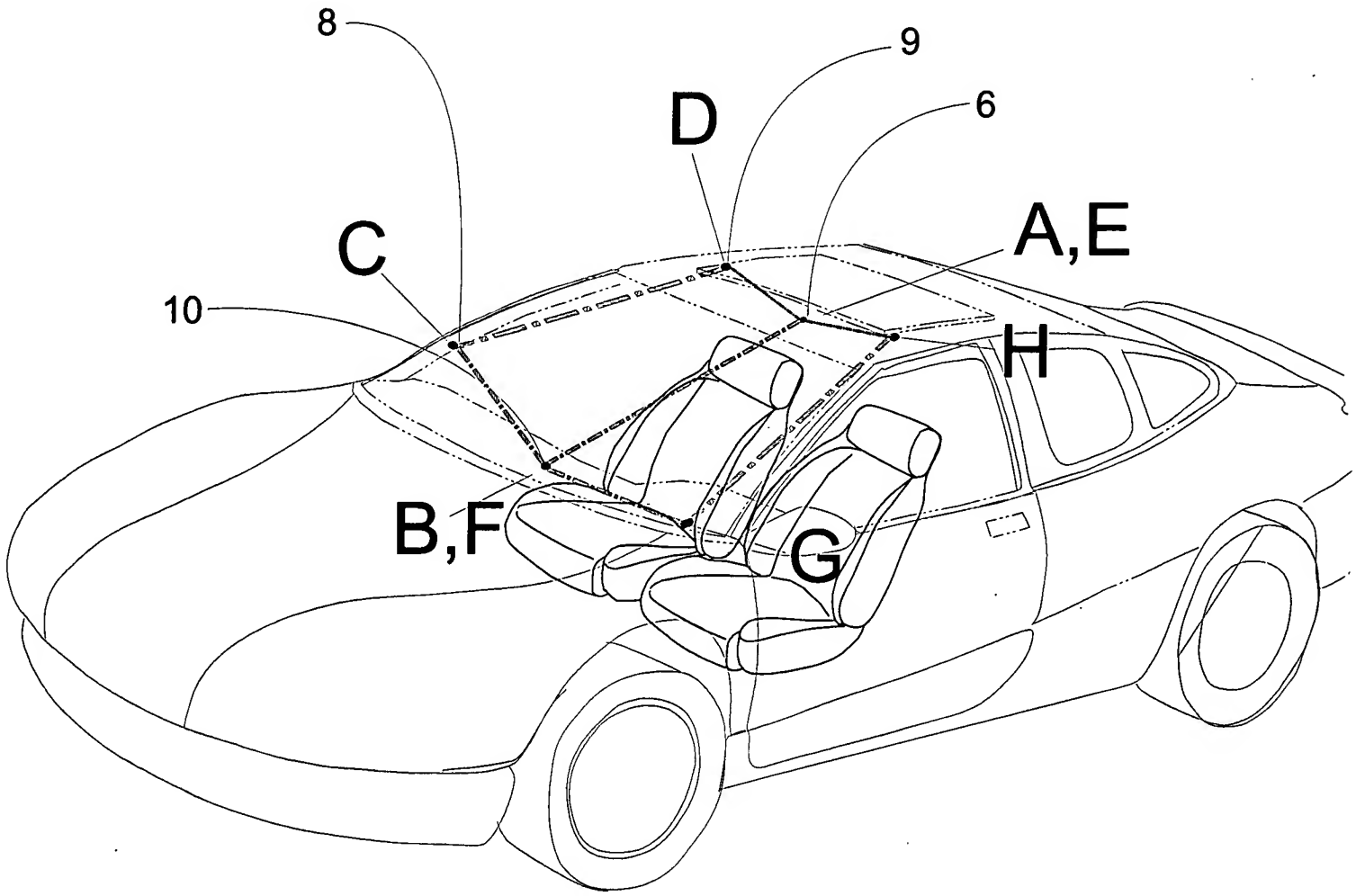


FIG. 36

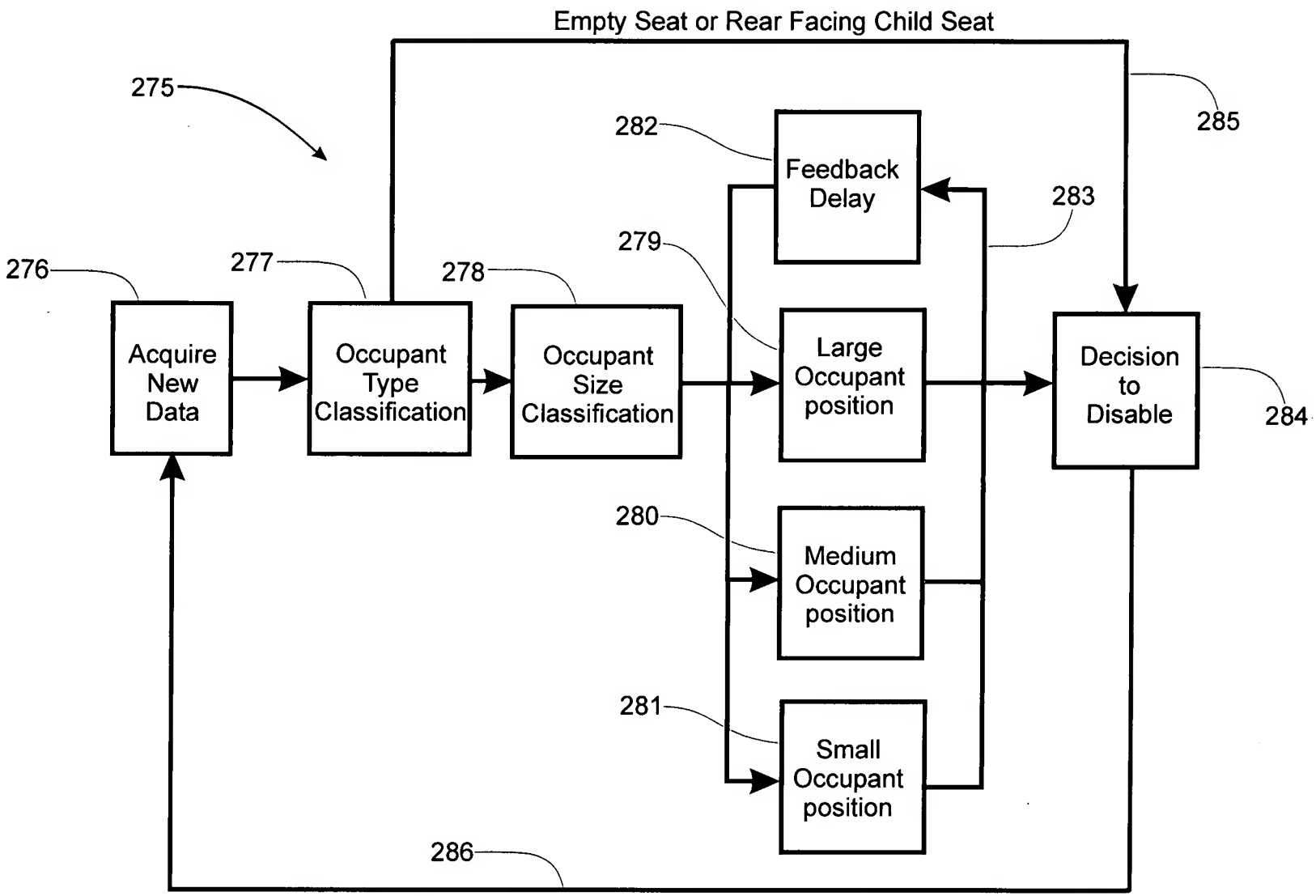

Empty Seat or Rear Facing Child Seat
275
285
282
Feedback Delay
283
279
276
277
278
Acquire New Data
Occupant Type Classification
Occupant Size Classification
Large Occupant position
Decision to Disable
284
280
Medium Occupant position
281
Small Occupant position
286

FIG. 37

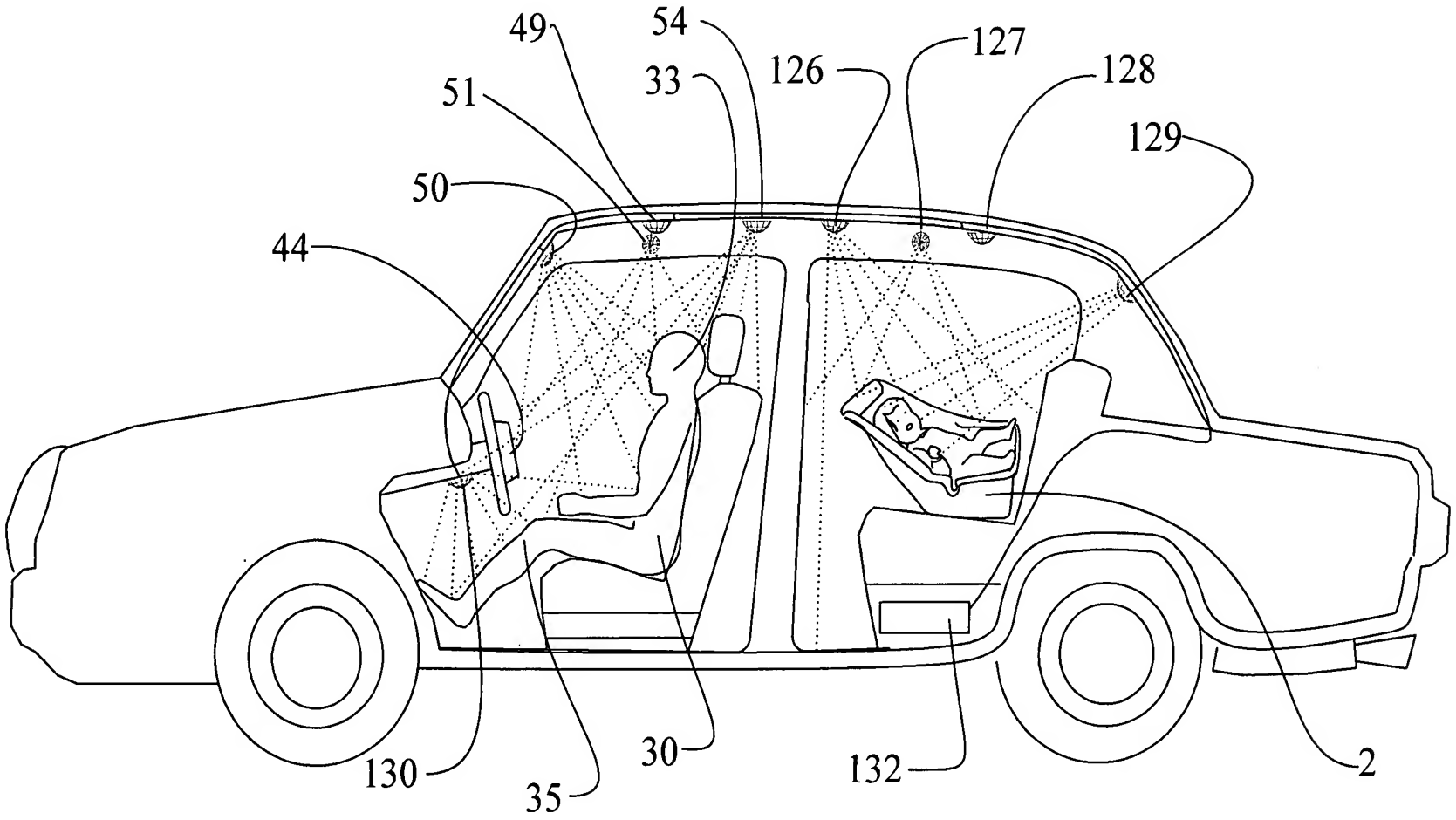


FIG. 38

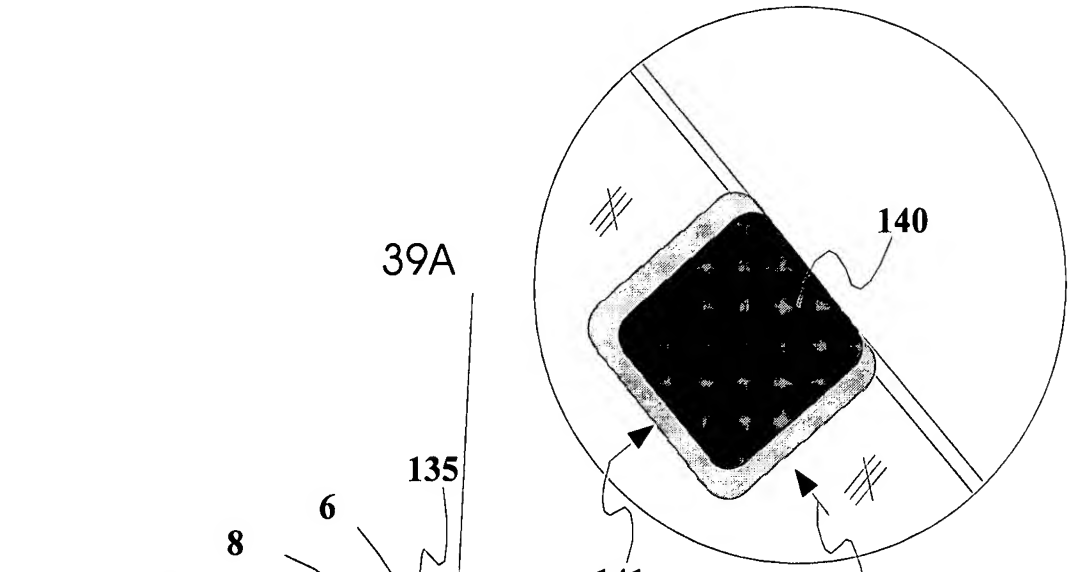


FIG. 39A

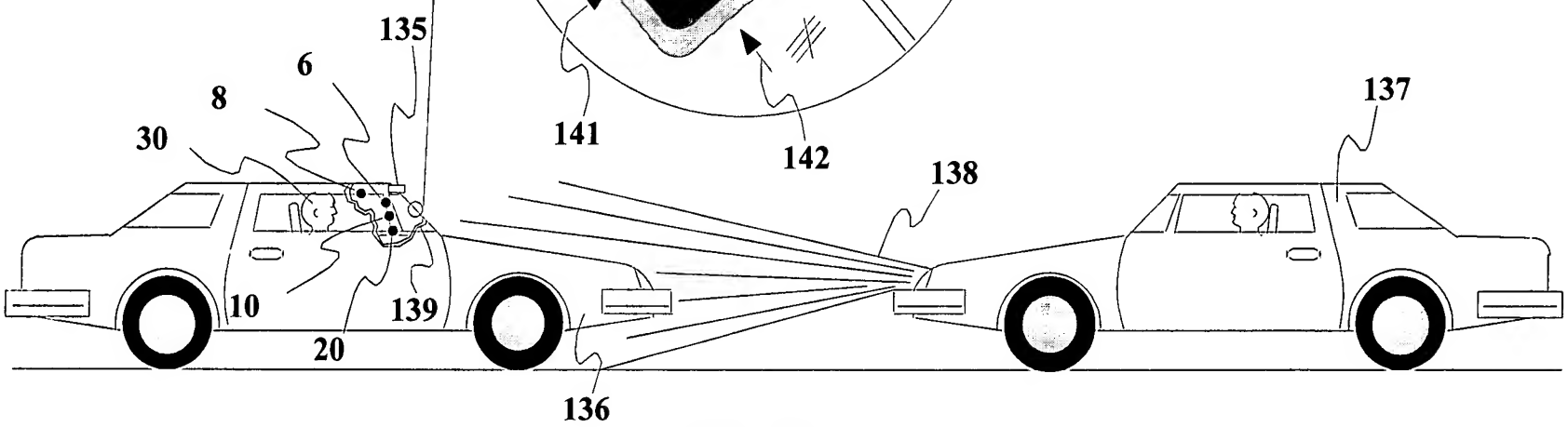


FIG. 39

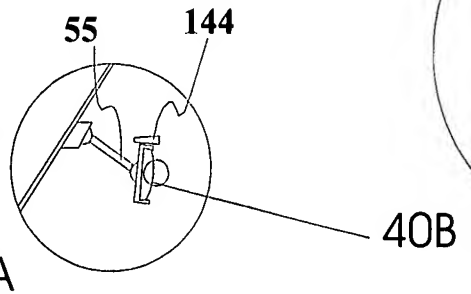


FIG. 40A

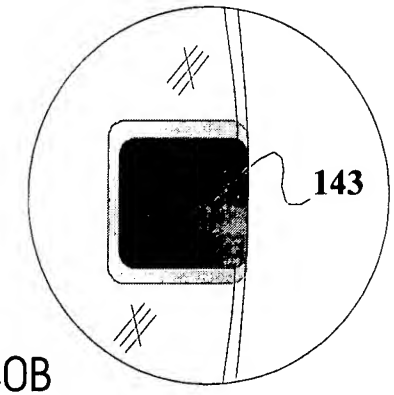


FIG. 40B

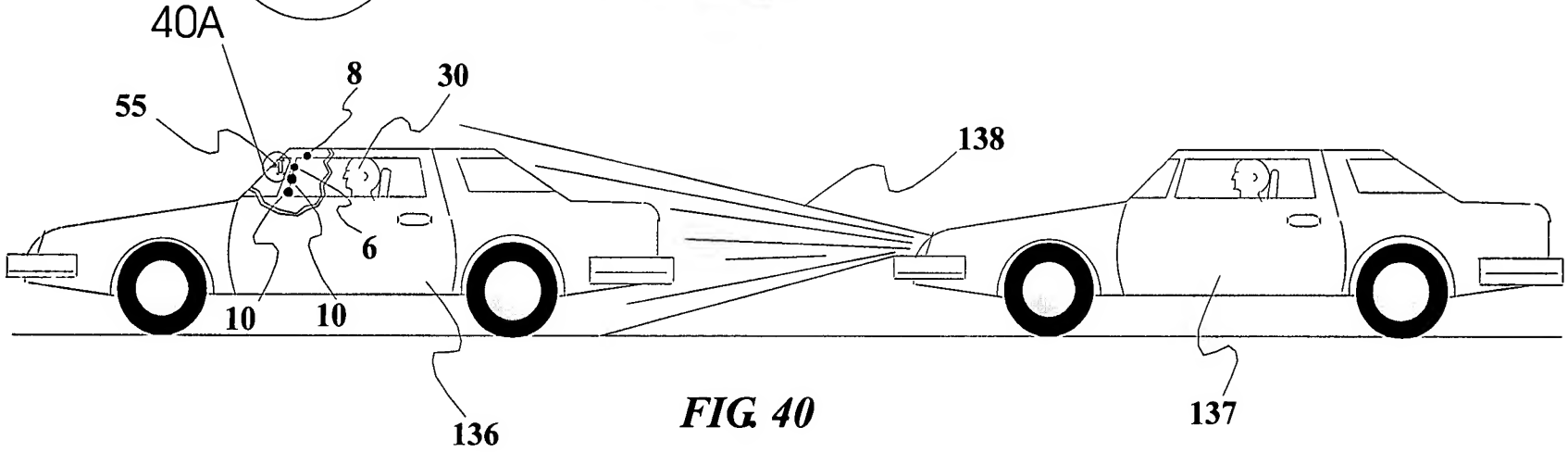


FIG. 40

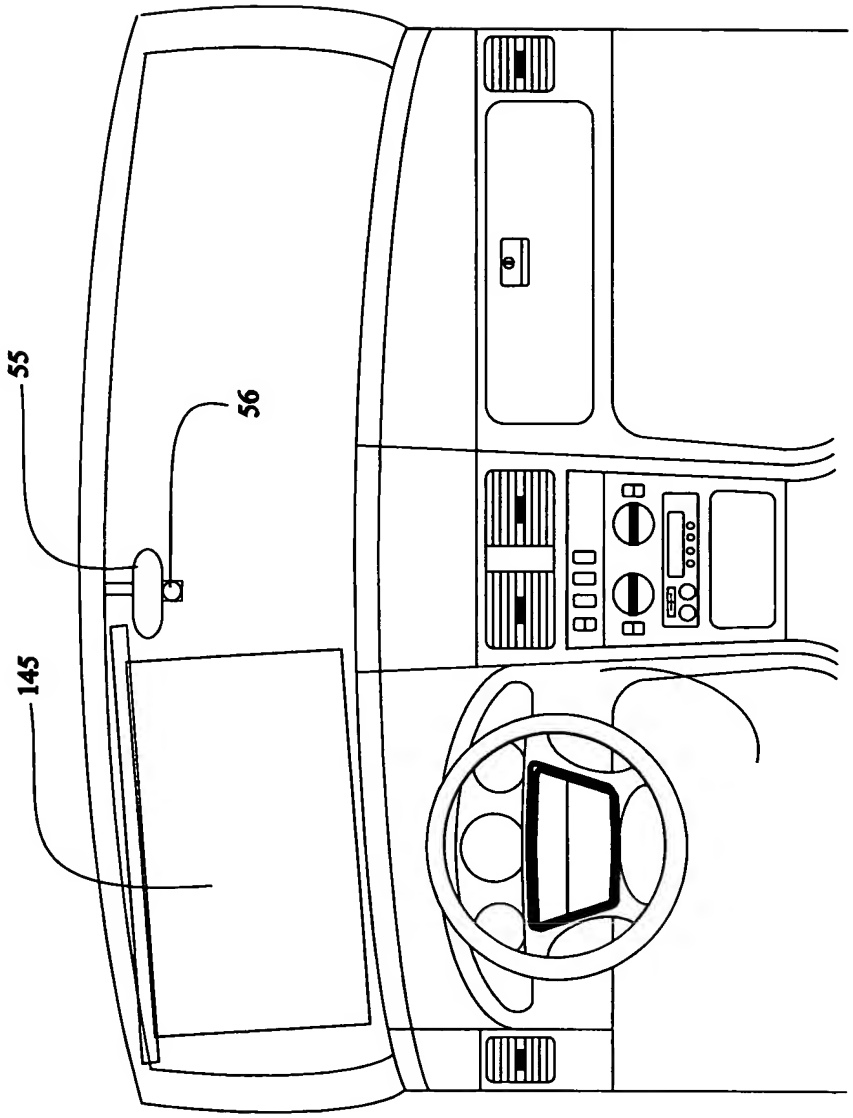


FIG. 41

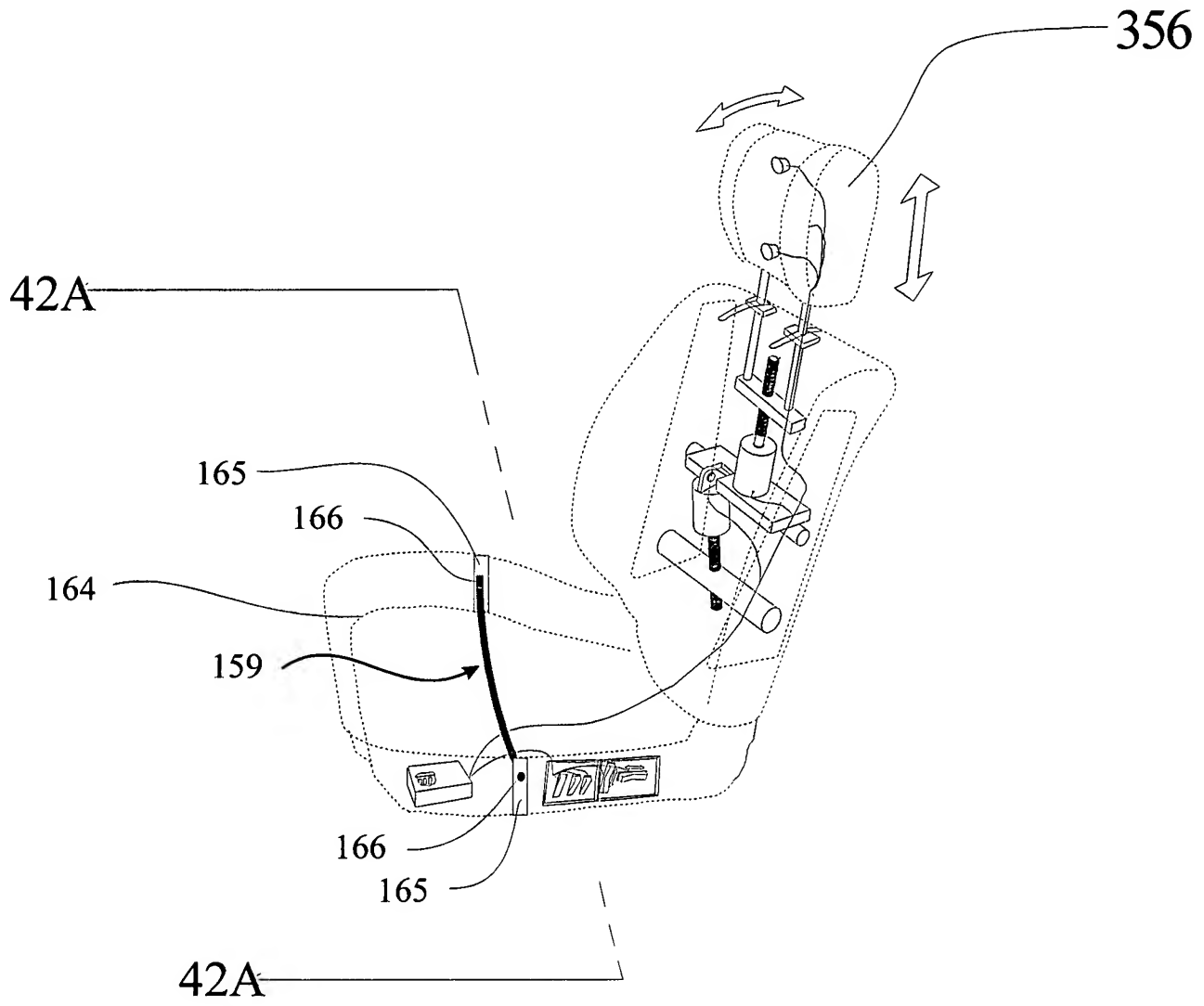


FIG. 42

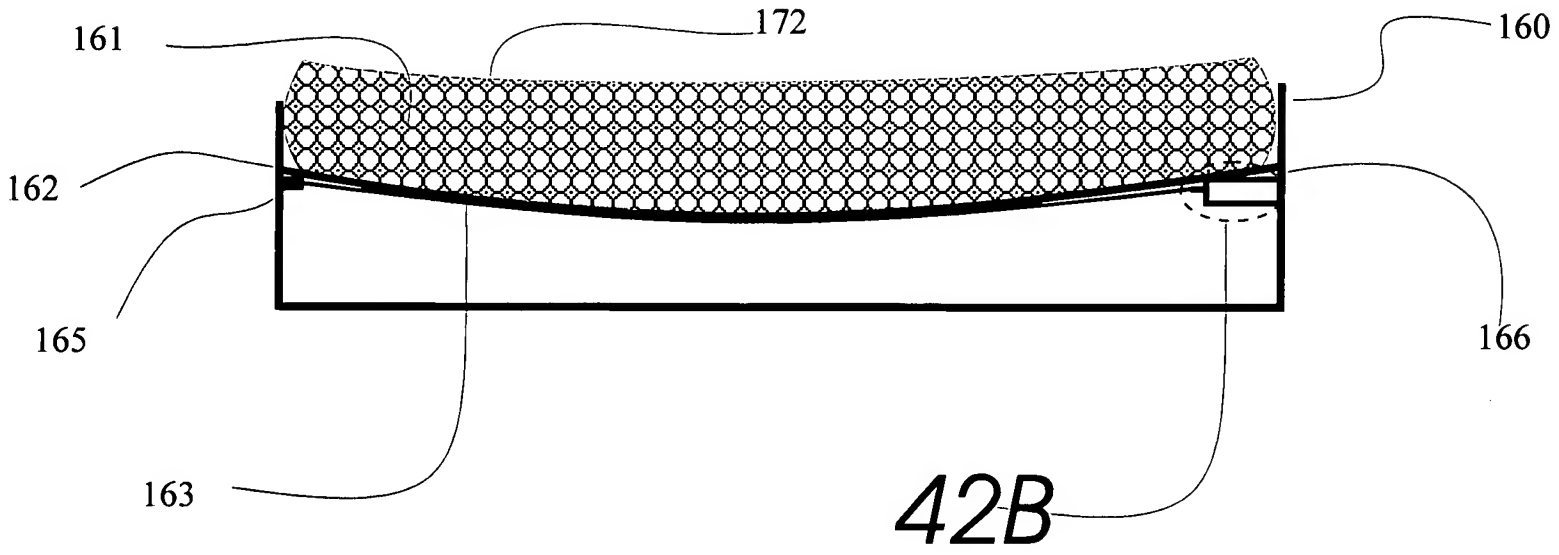


FIG. 42A

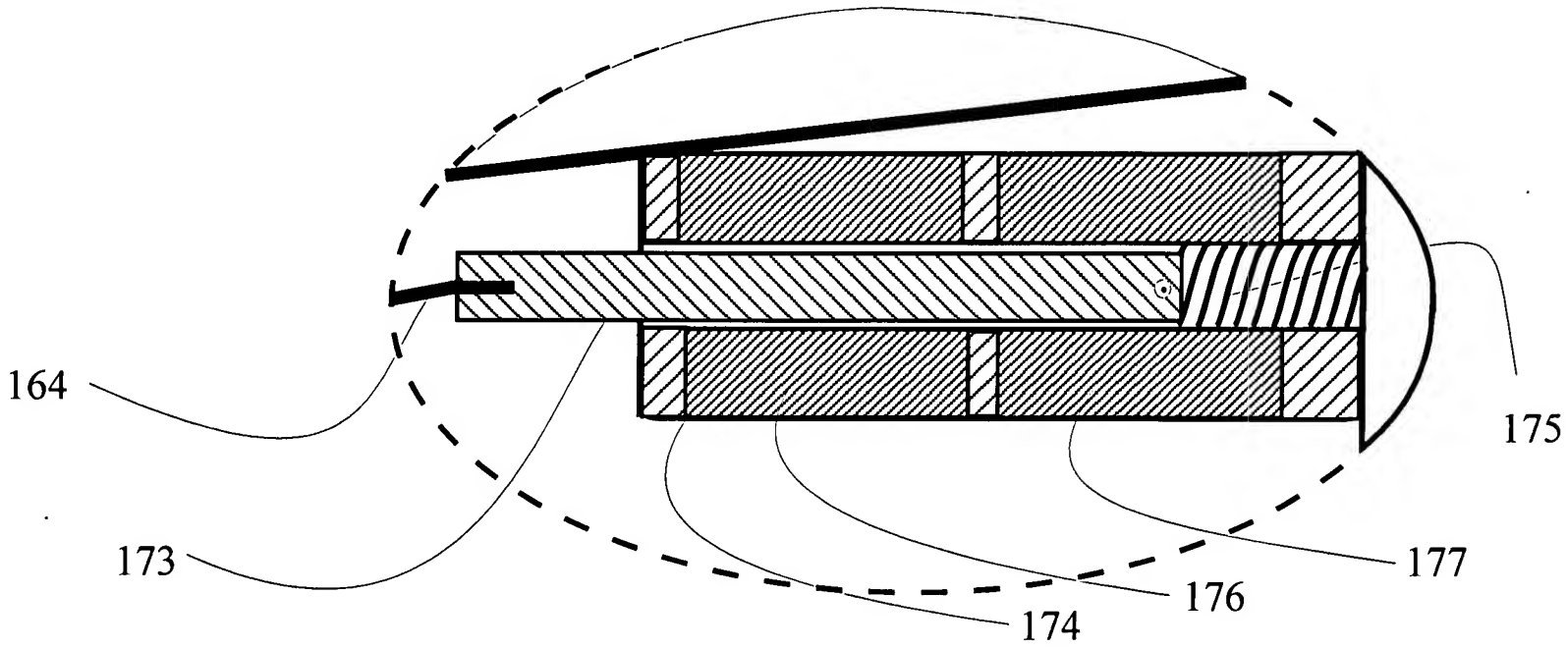


FIG. 42B

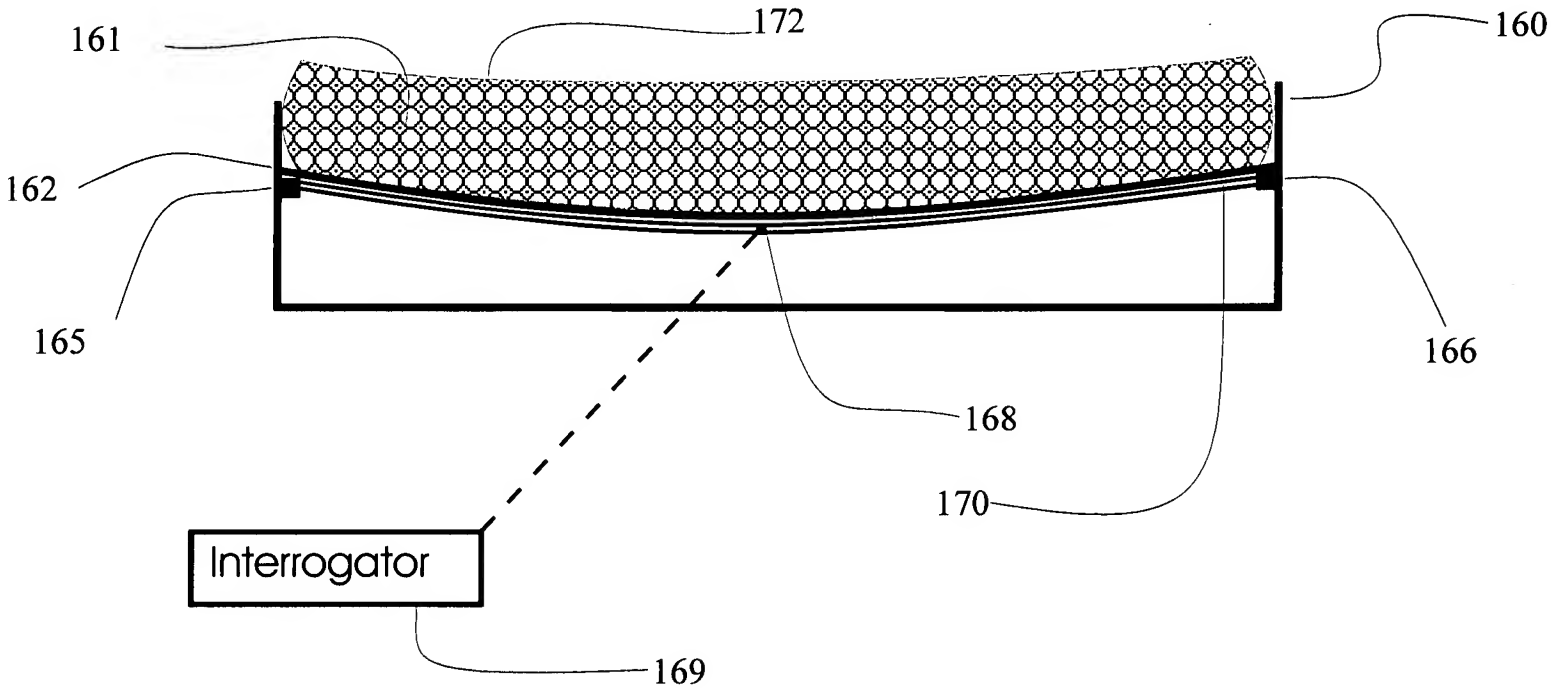


FIG. 42C

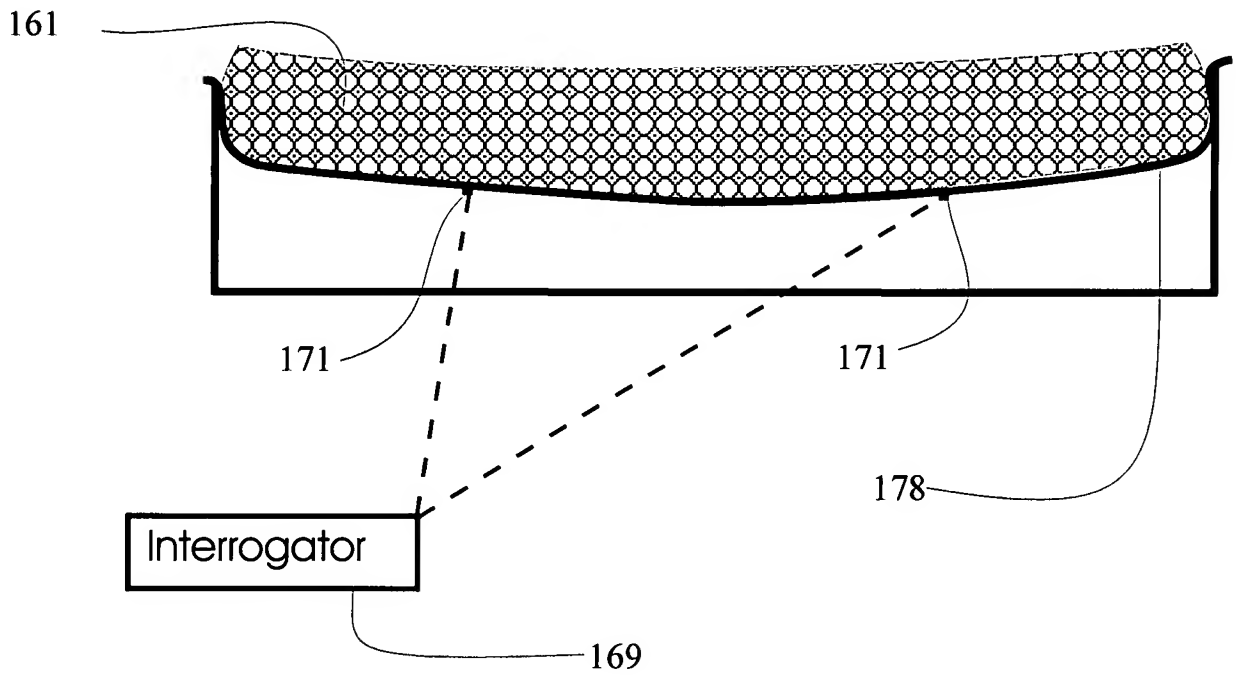


FIG. 42D

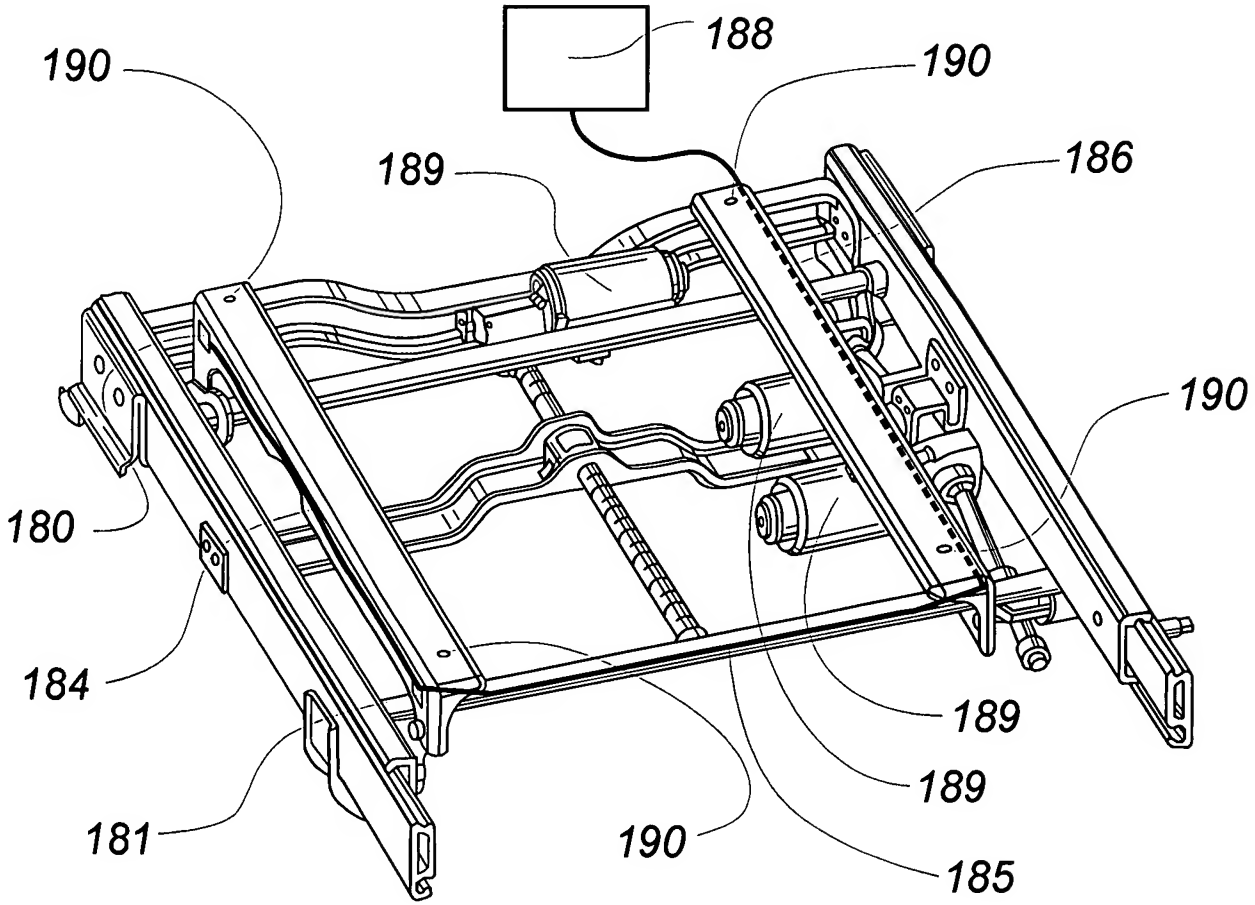


Fig. 43

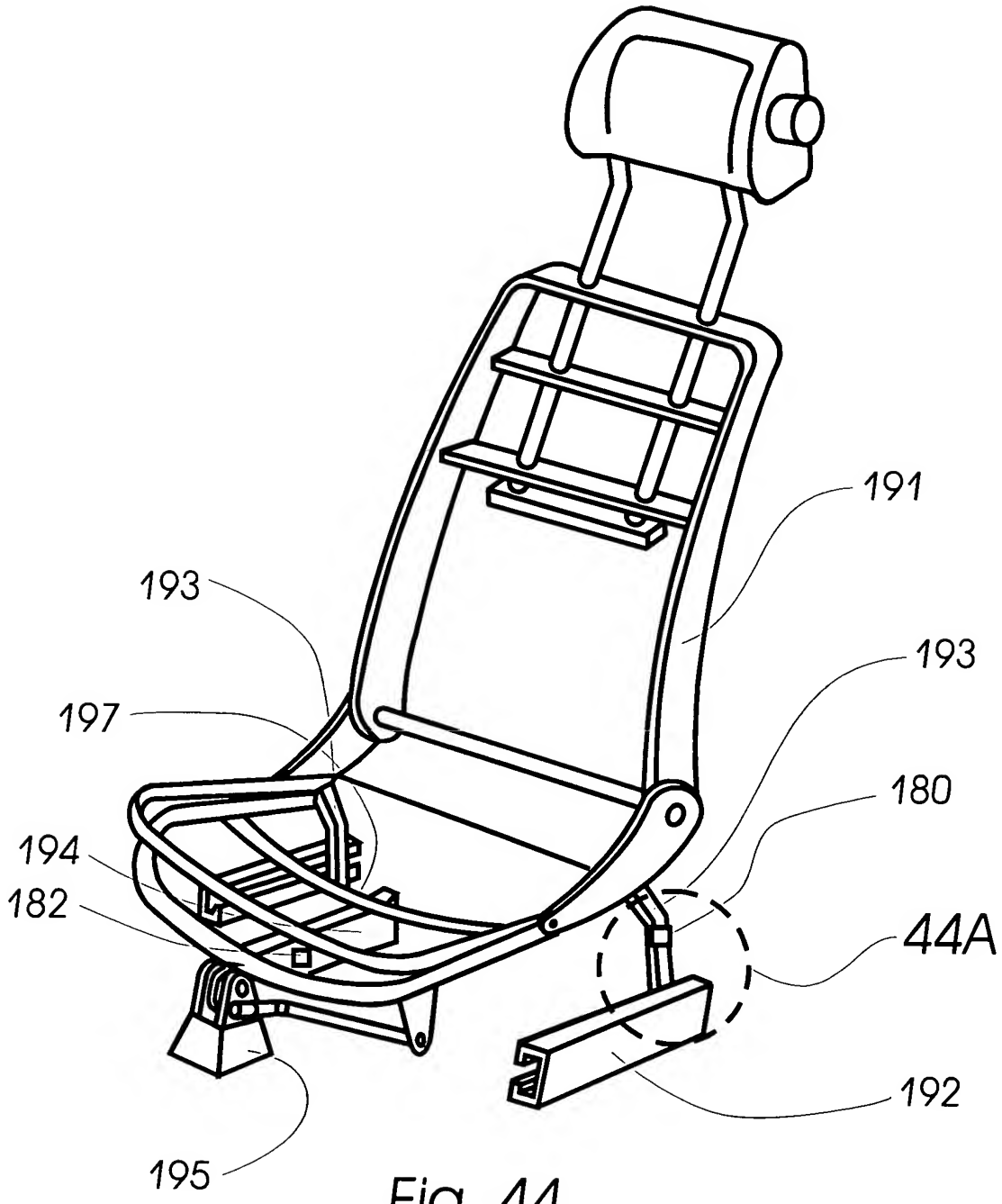


Fig. 44

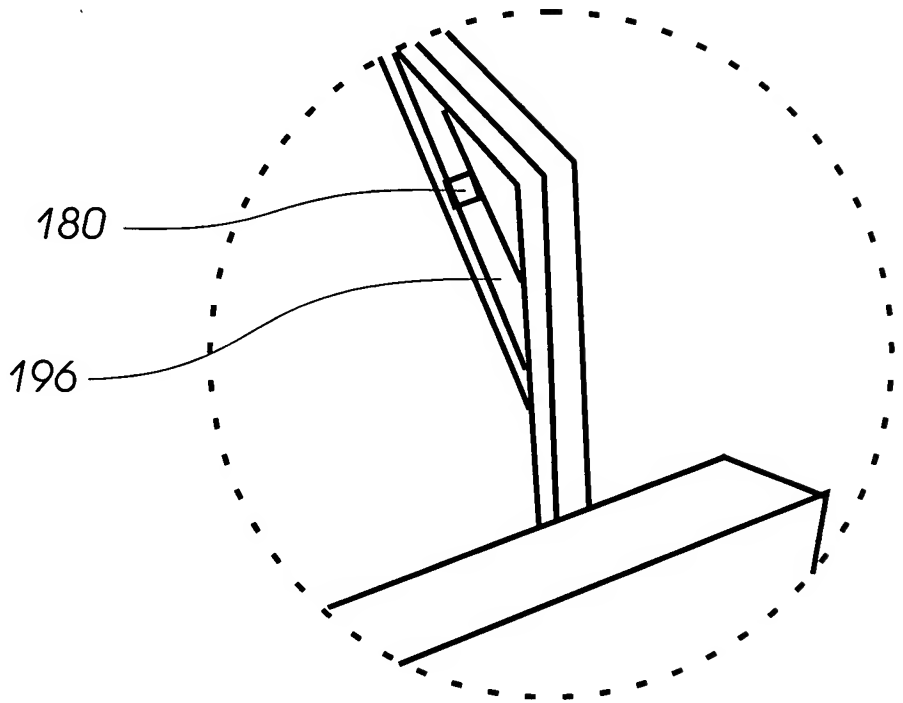


Fig. 44A

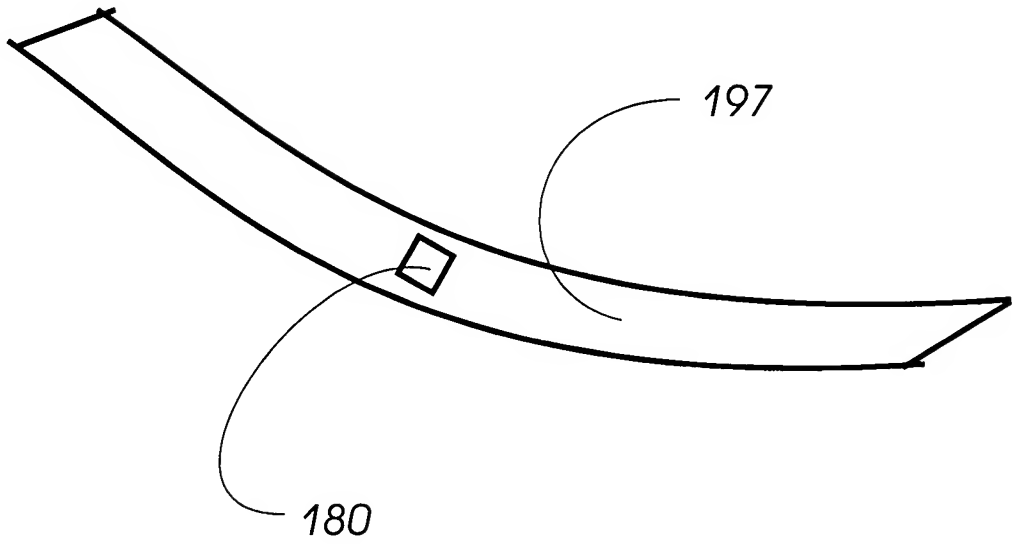


Fig. 44B

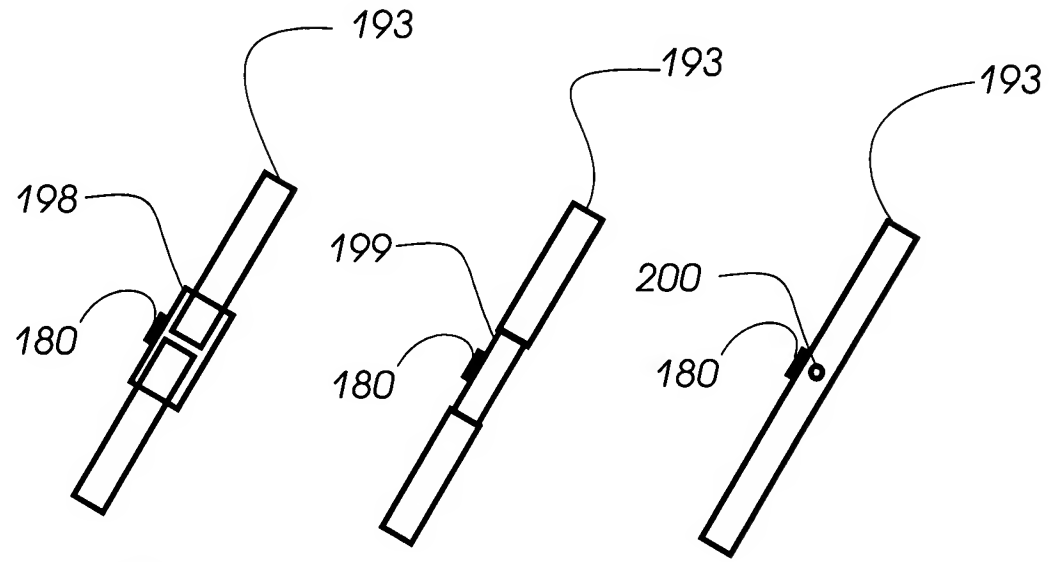


Fig. 45A Fig. 45B Fig. 45C

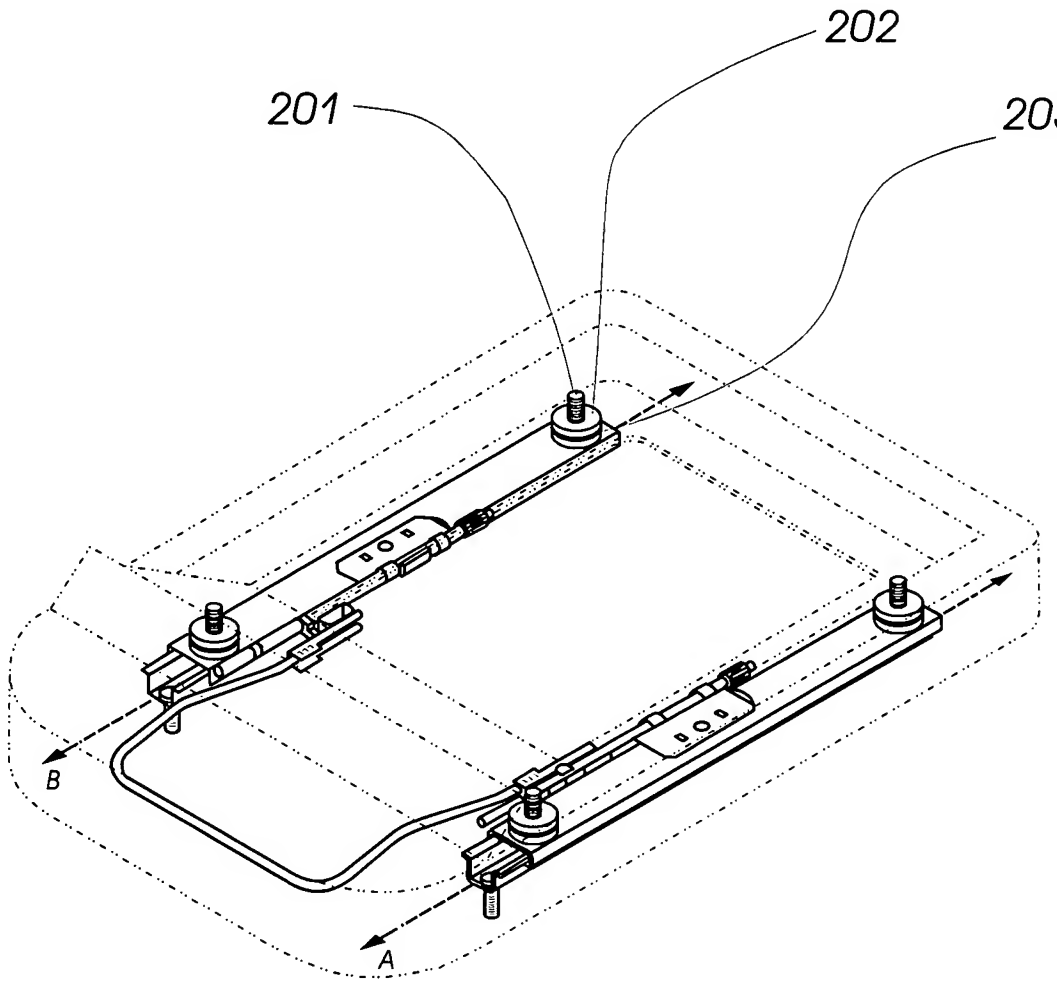


Fig. 46

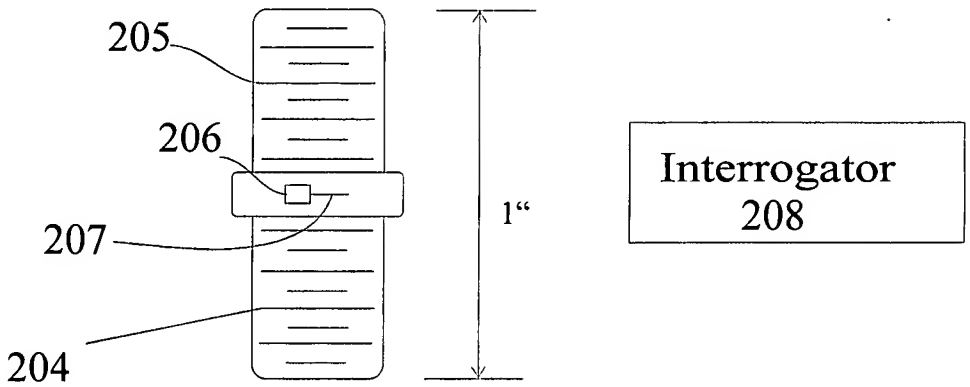


Fig. 46A

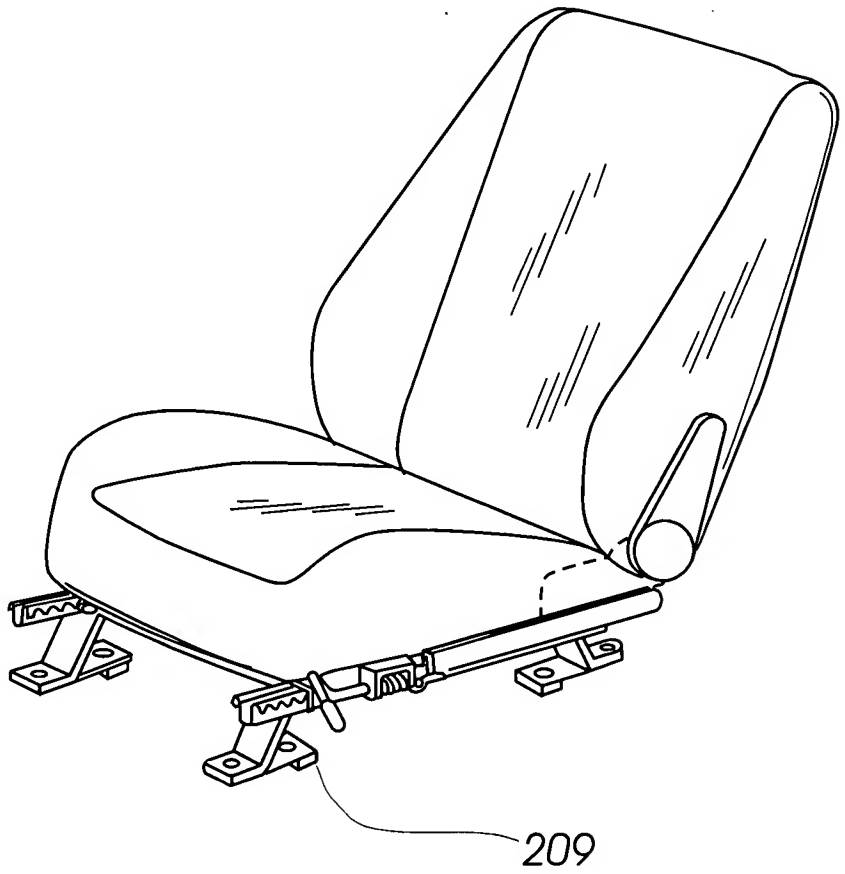


Fig. 47

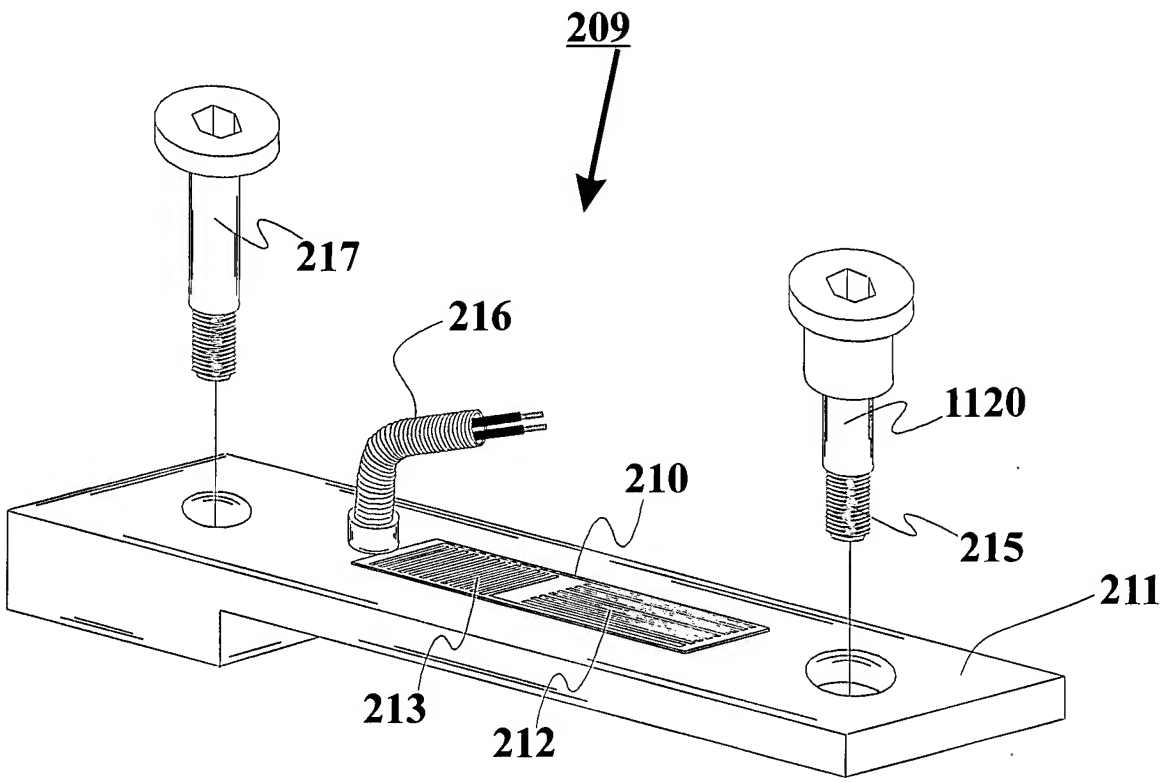


FIG. 47A

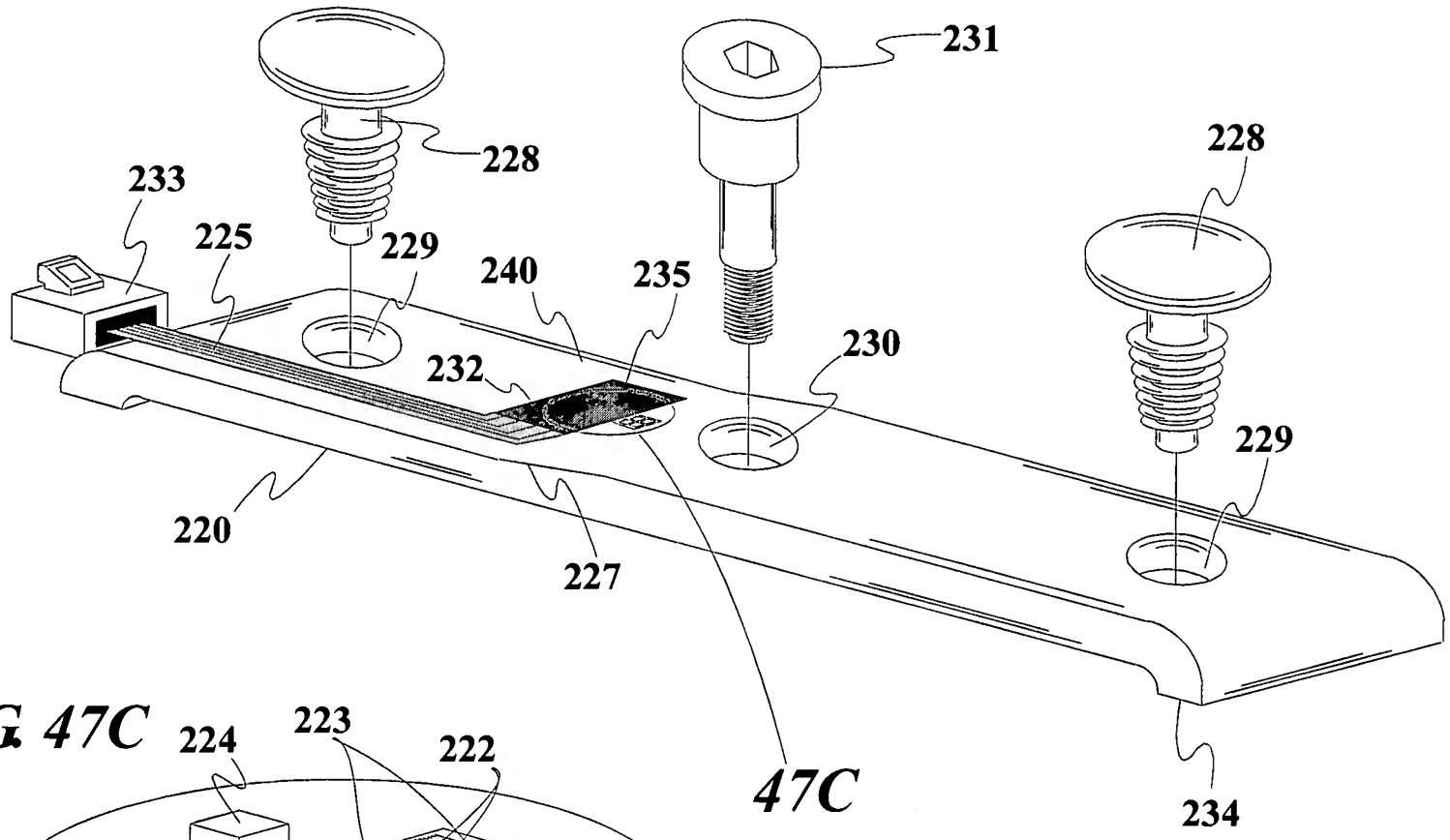


FIG. 47B

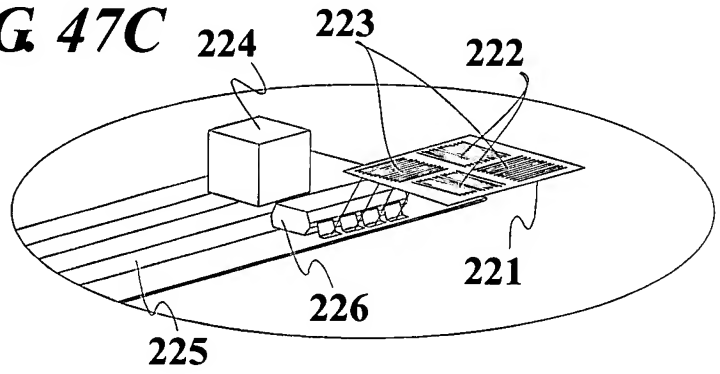


FIG. 47C

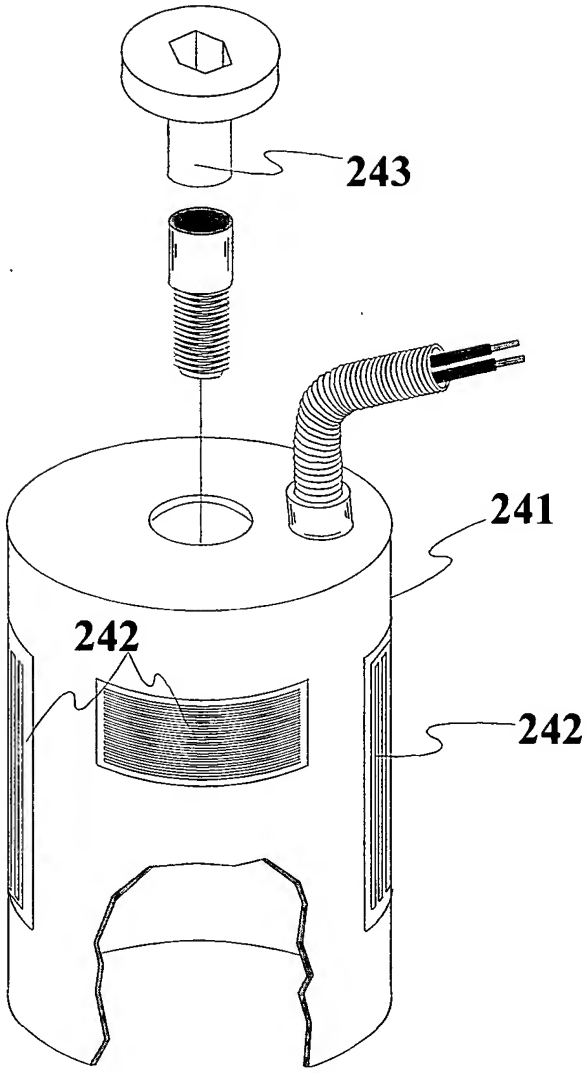


FIG. 47D

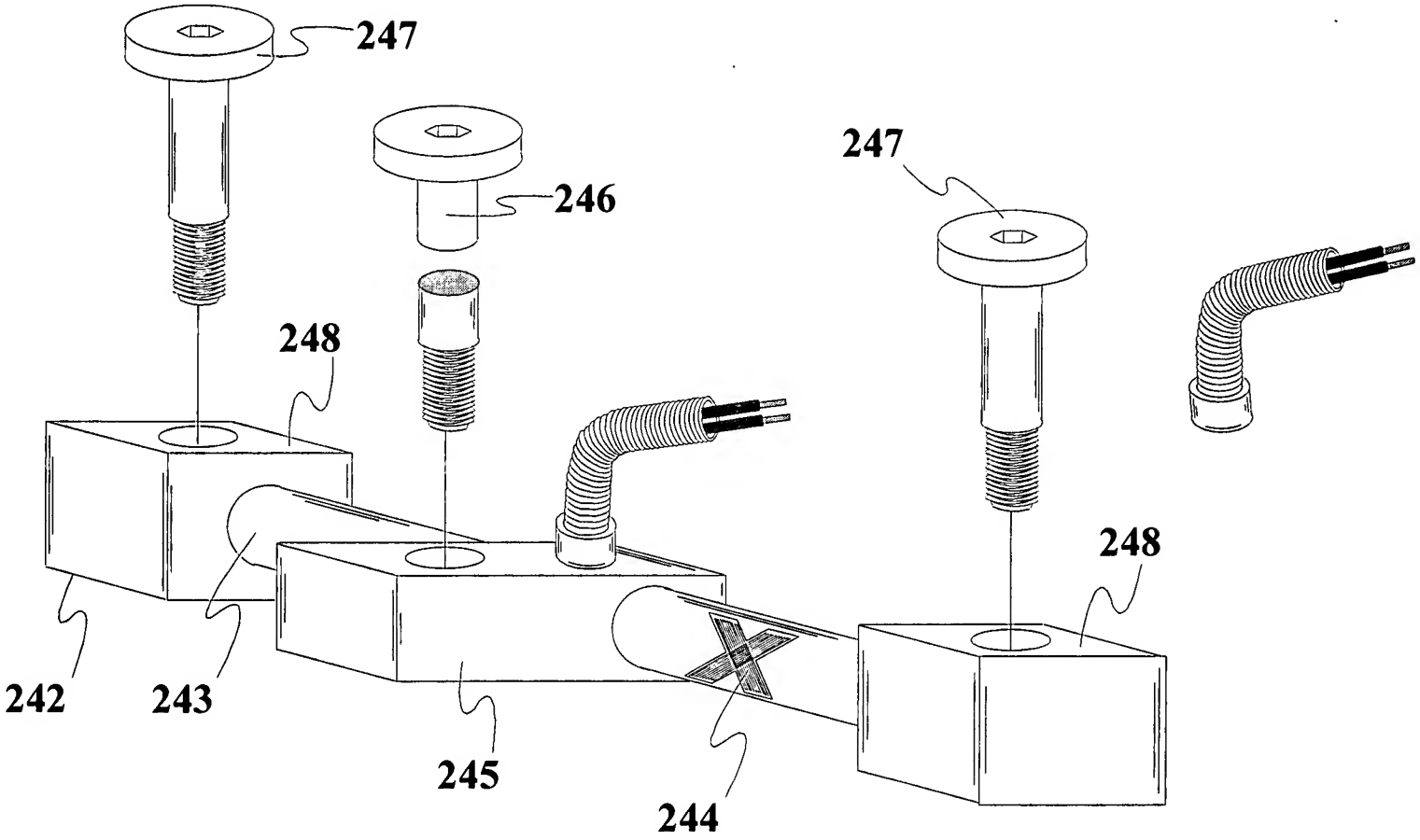


FIG. 47E

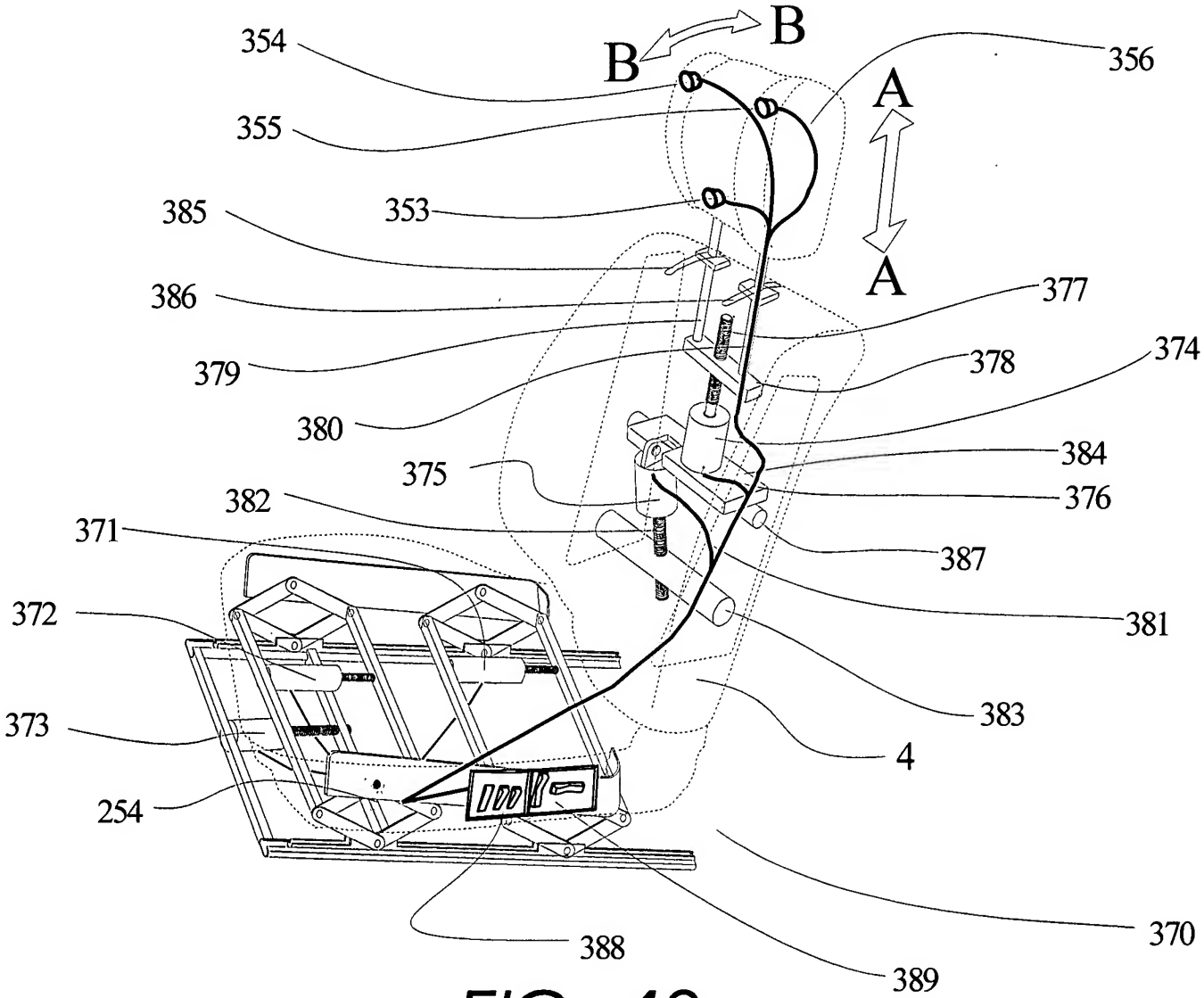

354
355
385
386
379
380
375
382
371
372
373
254
388
389
370
B
B
A
A
353
356
377
378
374
384
376
387
381
383
4

FIG. 48

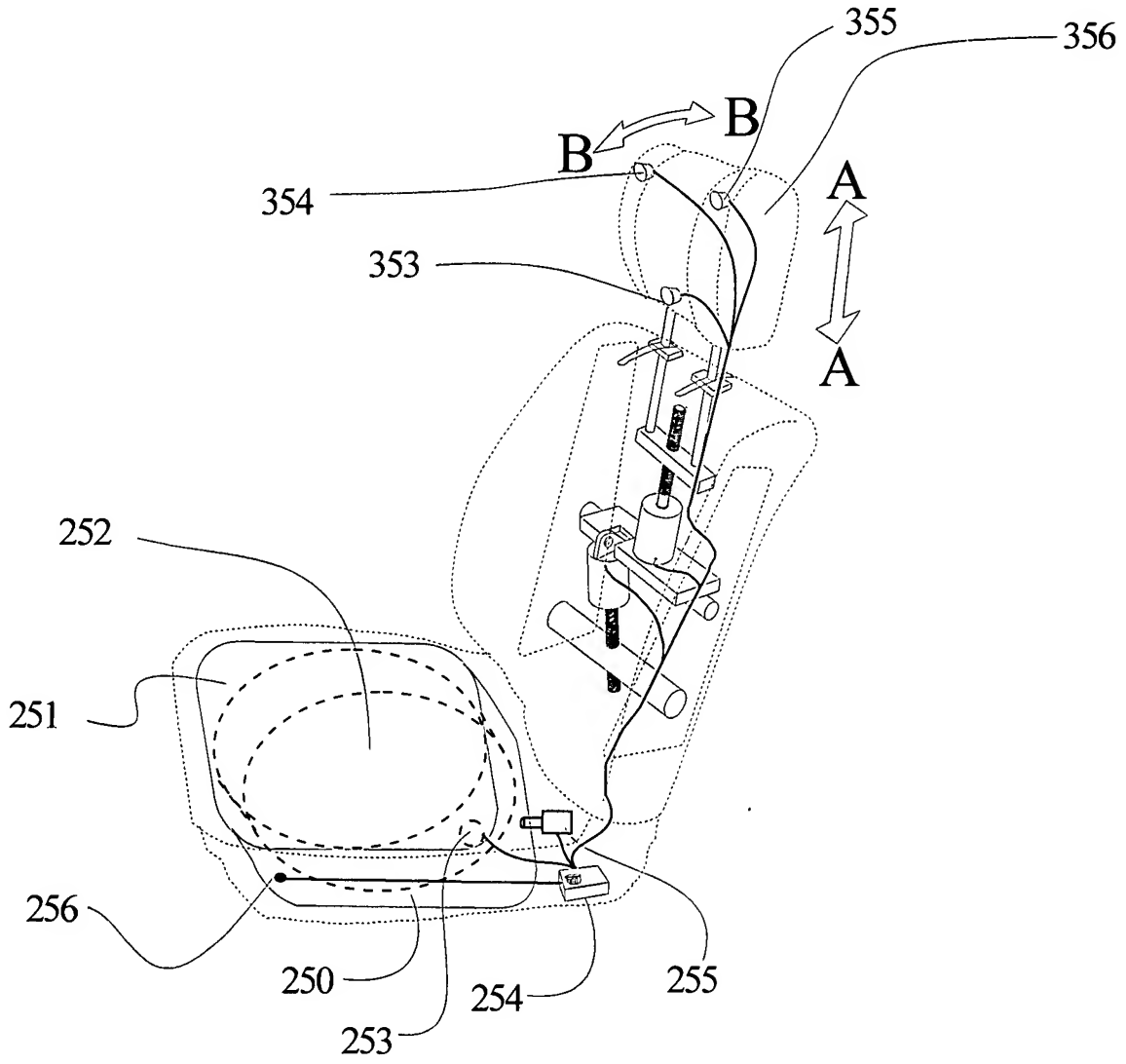


FIG. 49

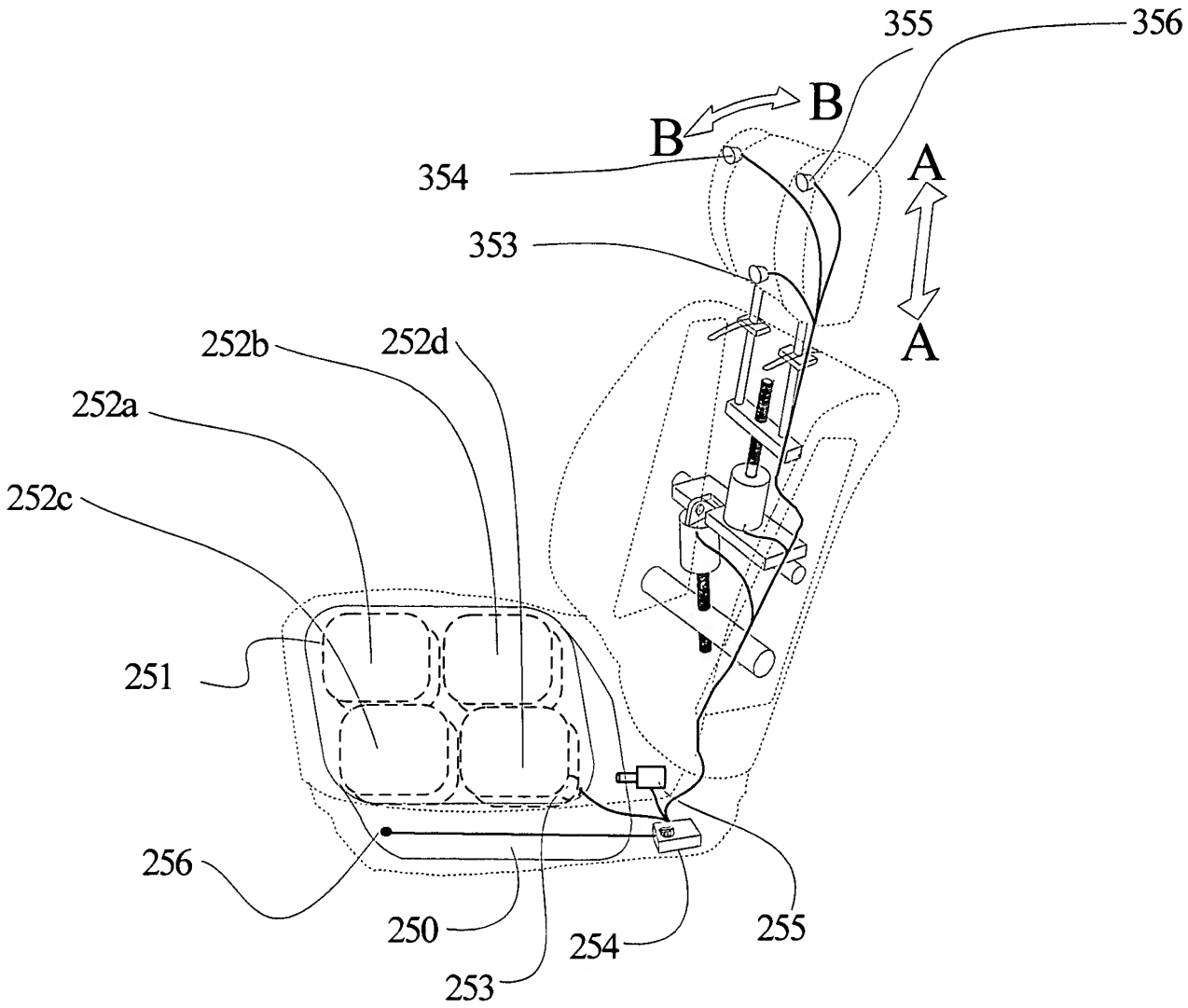

355
356
B
B
354
A
353
A
252b
252d
252a
252c
251
256
250
253
254
255

FIG. 49A

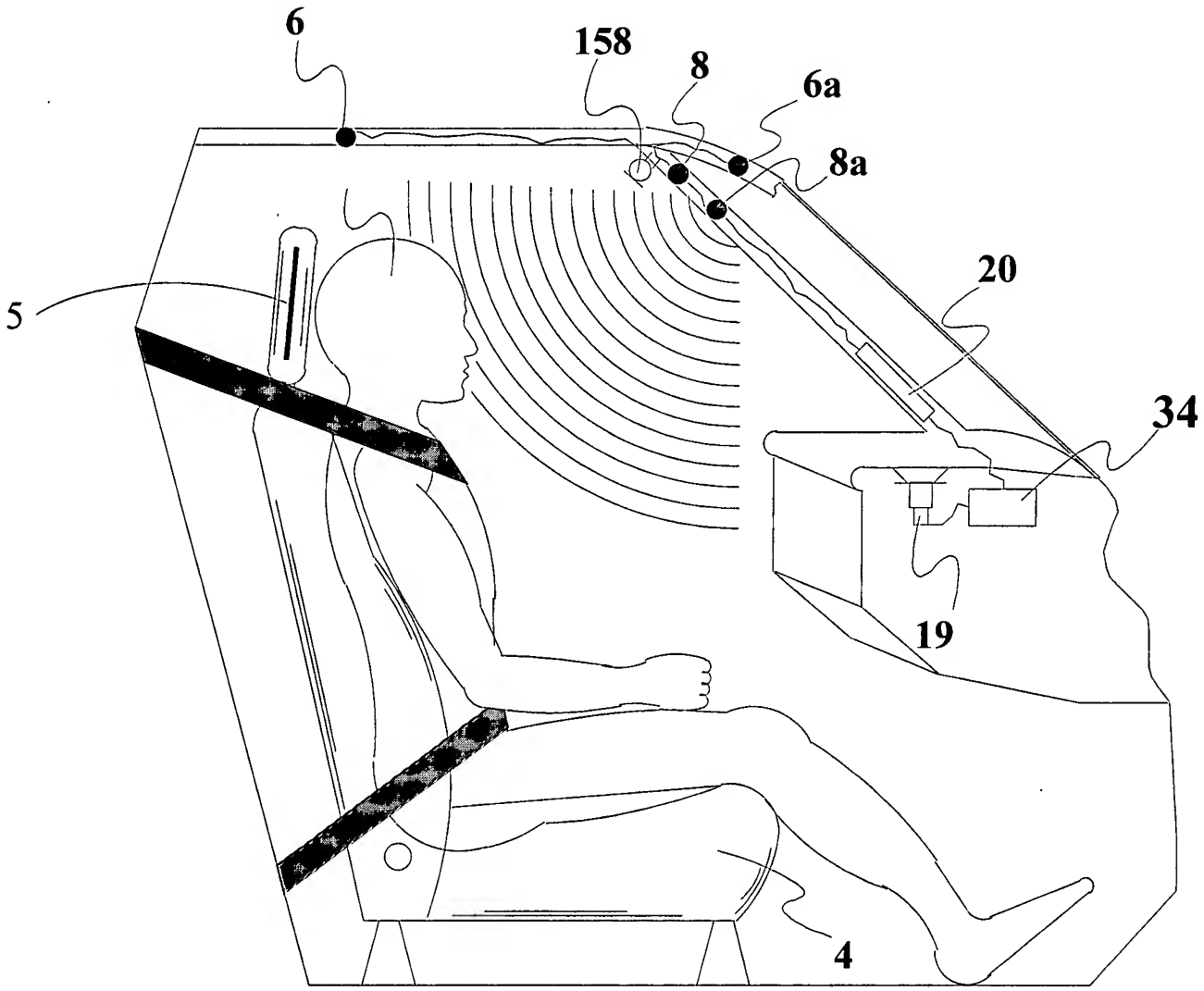


FIG. 50

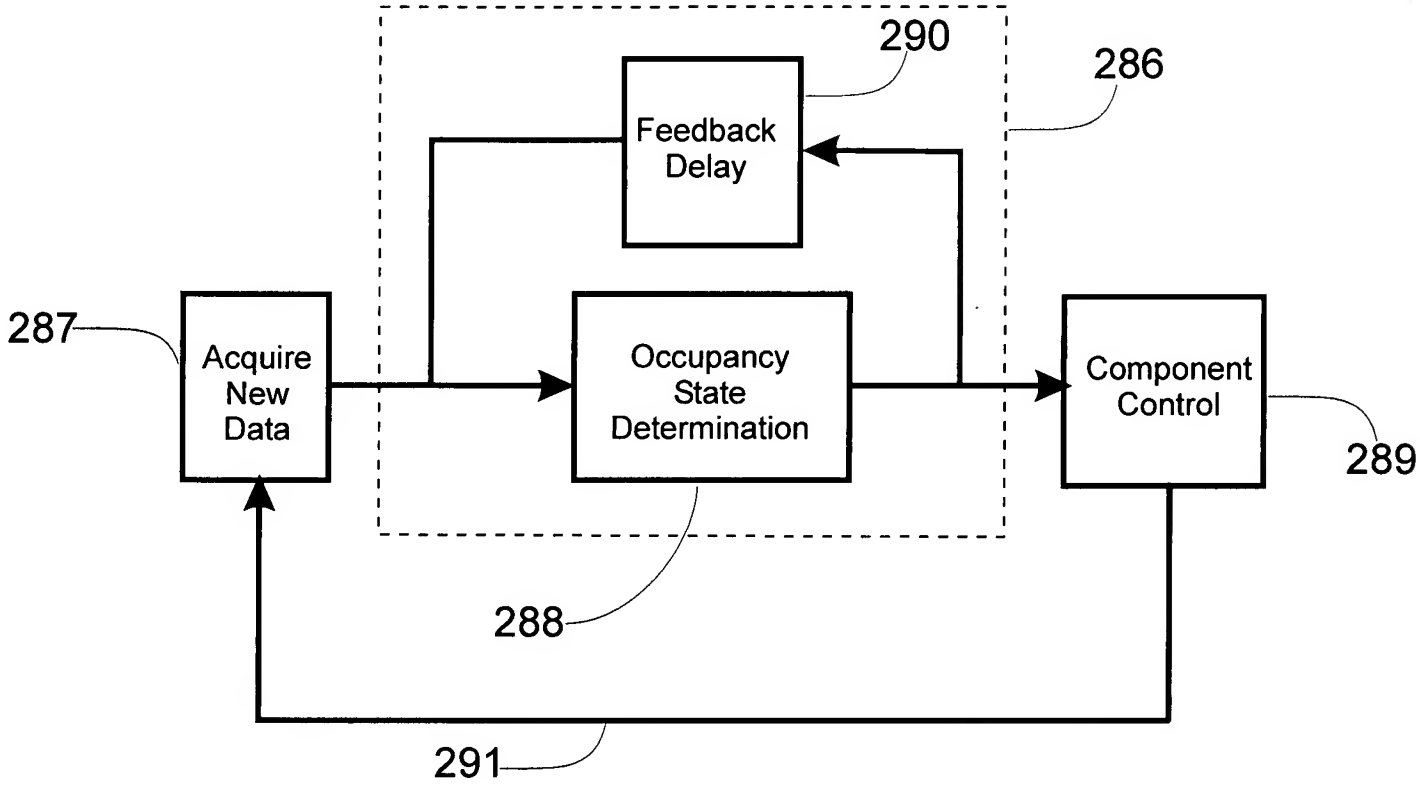

290
286
Feedback Delay
287
Acquire New Data
Occupancy State Determination
Component Control
289
288
291

FIG. 51

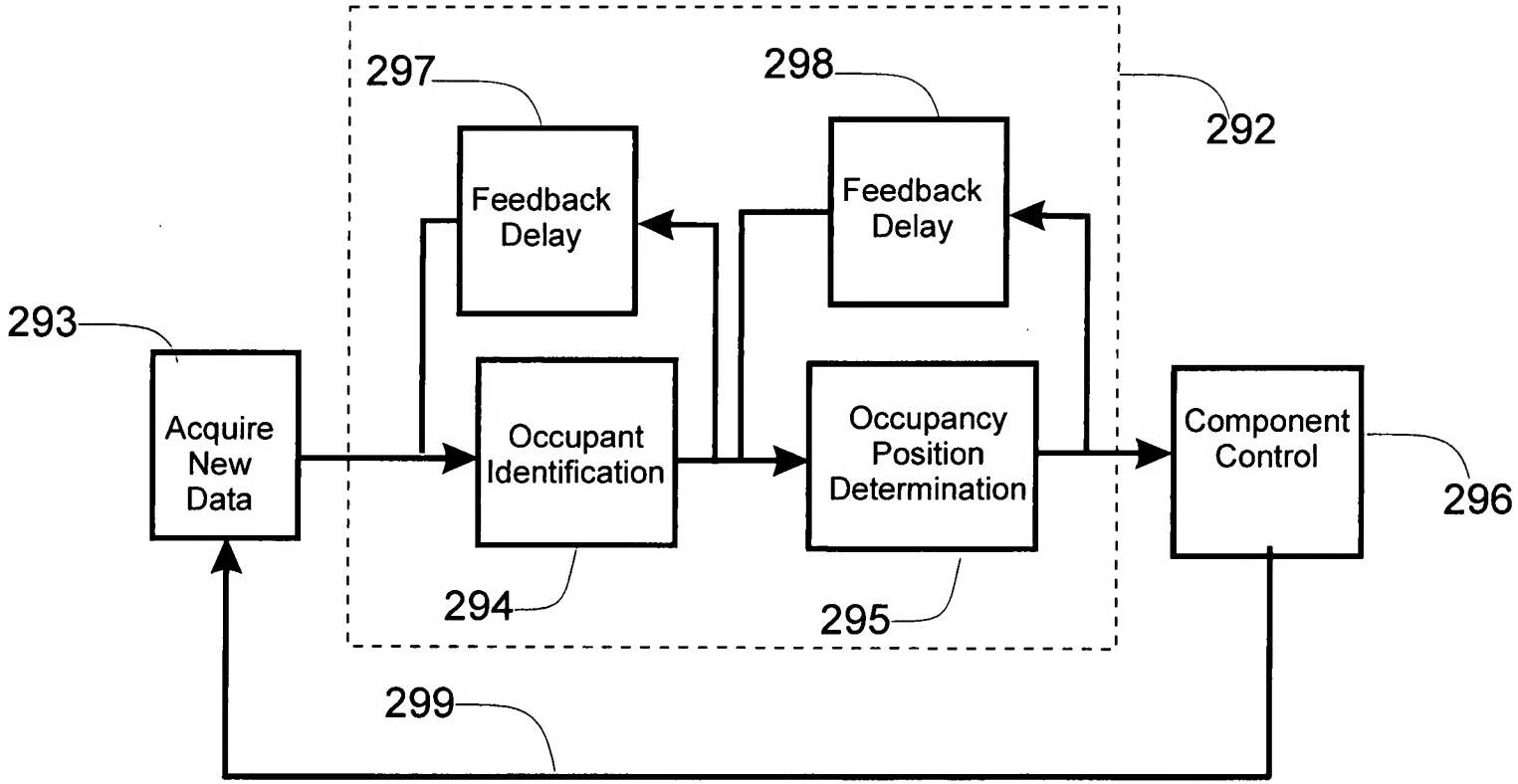

297
298
292
Feedback Delay
Feedback Delay
293
Acquire New Data
Occupant Identification
Occupancy Position Determination
Component Control
296
294
295
299

FIG. 52

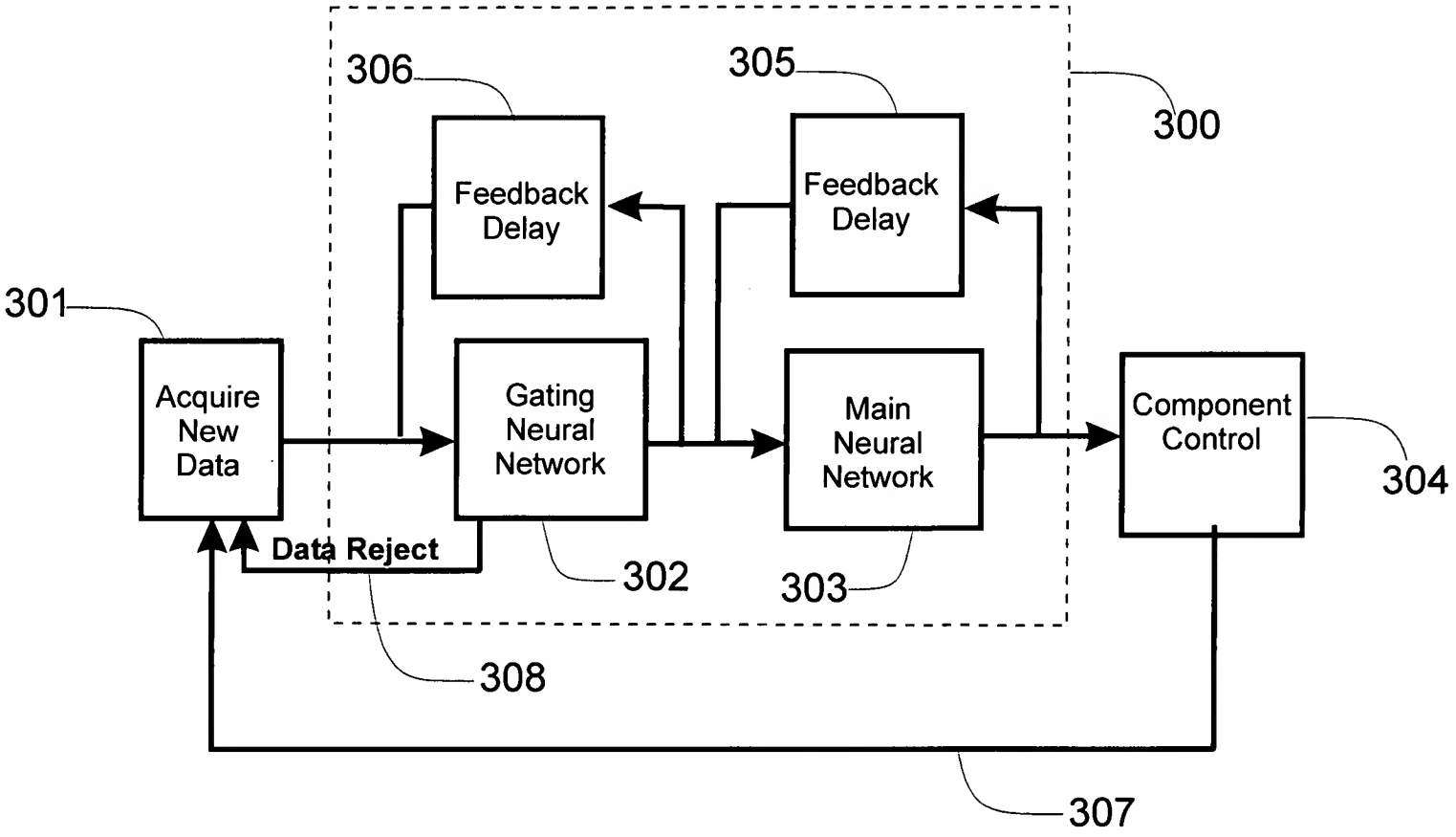

306
305
300
Feedback Delay
Feedback Delay
301
Acquire New Data
Gating Neural Network
Main Neural Network
Component Control
304
Data Reject
302
303
308
307

FIG. 53

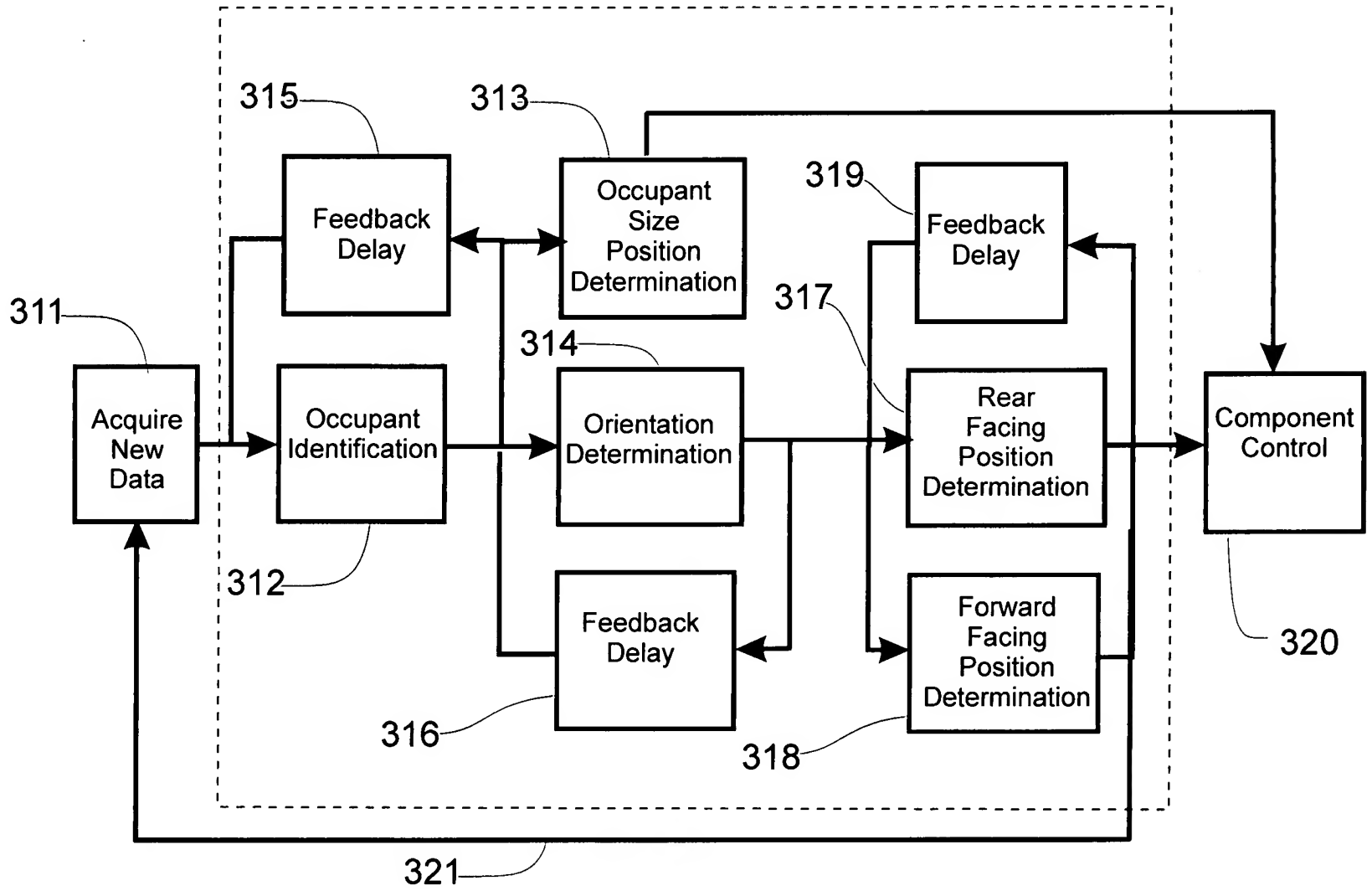

315
313
Feedback Delay
Occupant Size Position Determination
319
Feedback Delay
317
311
314
Acquire New Data
Occupant Identification
Orientation Determination
Rear Facing Position Determination
Component Control
312
Feedback Delay
Forward Facing Position Determination
320
316
318
321

FIG. 54

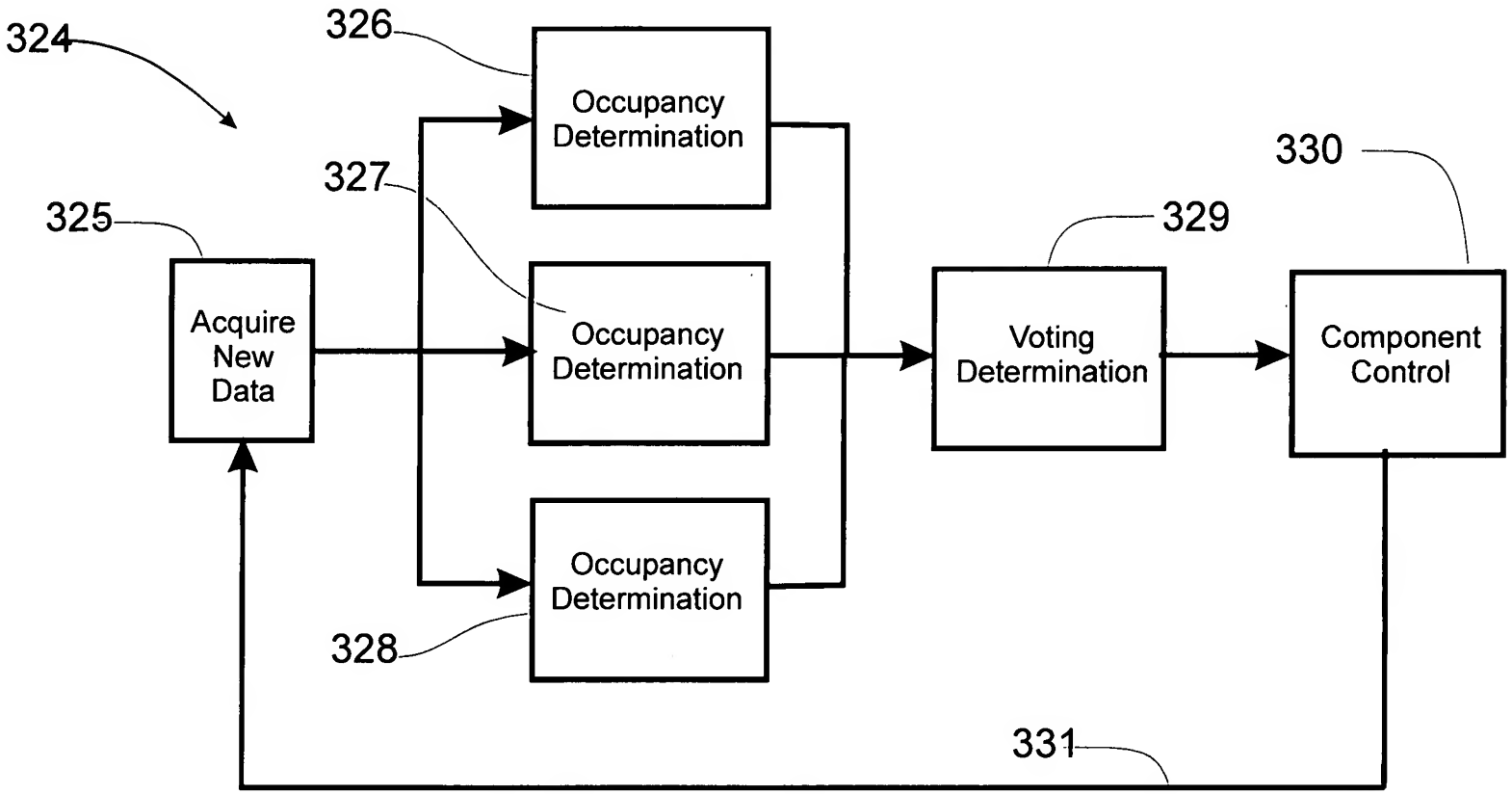

324
326
Occupancy Determination
327
325
330
329
Acquire New Data
Occupancy Determination
Voting Determination
Component Control
Occupancy Determination
328
331

FIG. 55

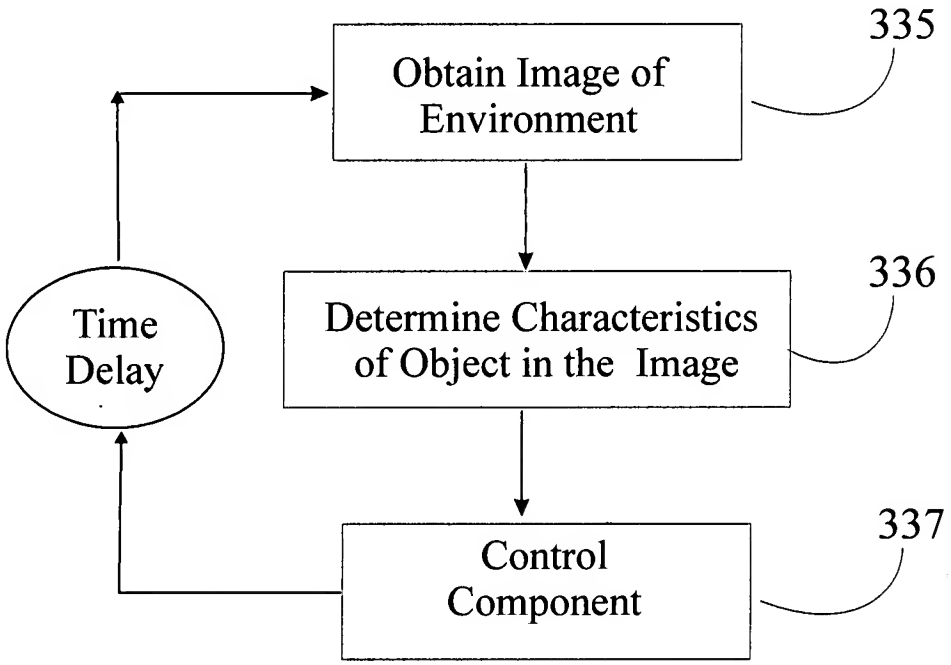

Obtain Image of Environment
335
Determine Characteristics of Object in the Image
336
Control Component
337
Time Delay

FIG. 56

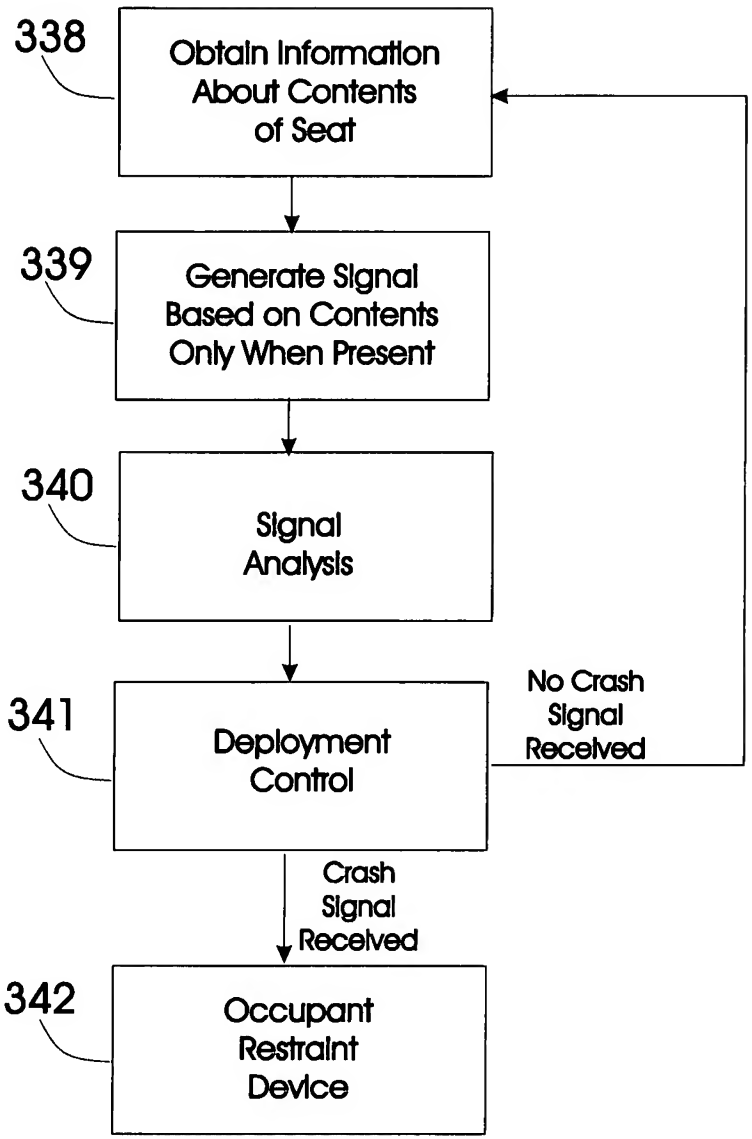
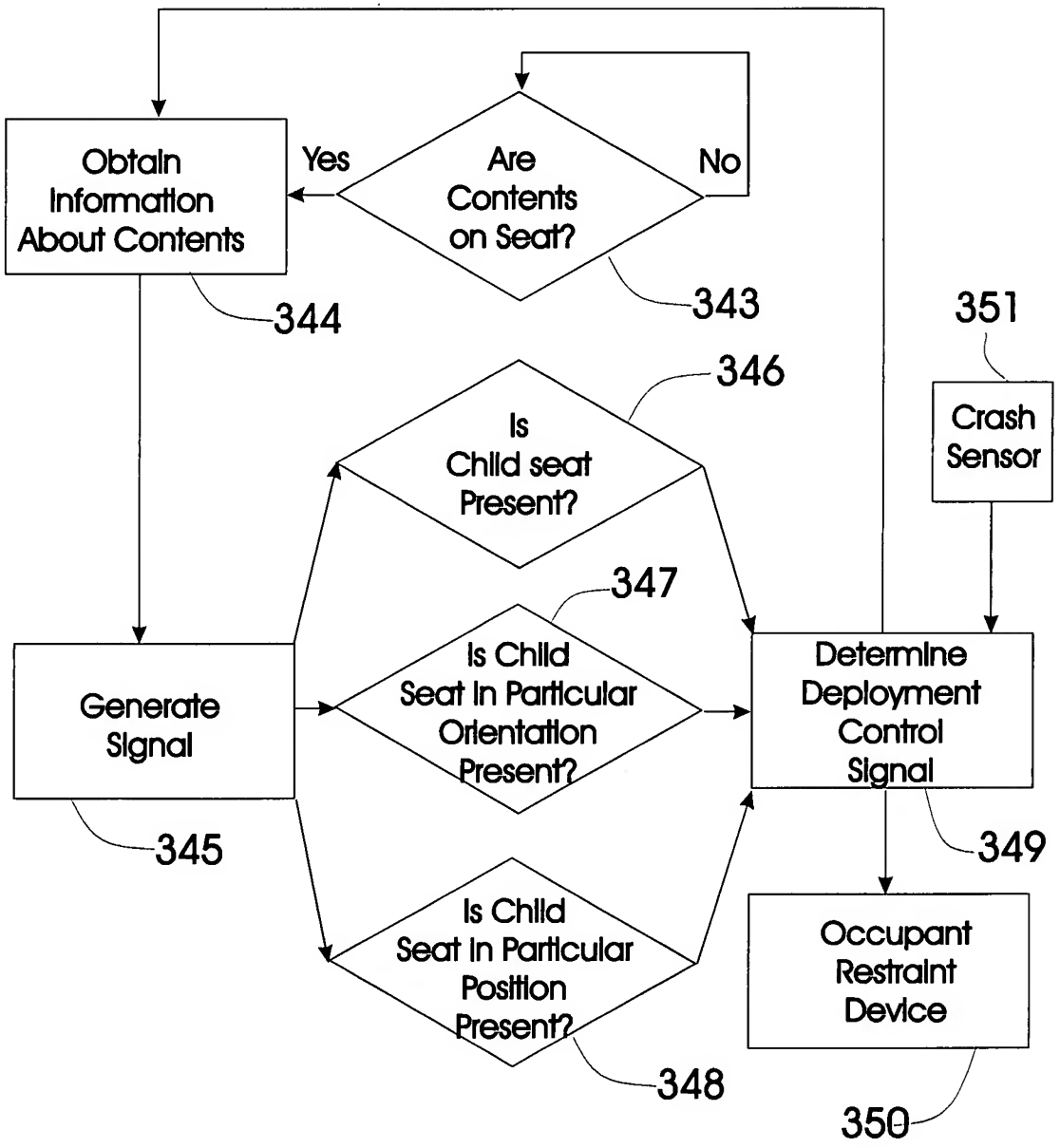

338
Obtain Information About Contents of Seat
339
Generate Signal Based on Contents Only When Present
340
Signal Analysis
341
Deployment Control
No Crash Signal Received
Crash Signal Received
342
Occupant Restraint Device

FIG. 57

FIG. 58


Obtain Information About Contents
Yes
Are Contents on Seat?
No
344
343
351
346
Crash Sensor
Is Child seat Present?
347
Generate Signal
Is Child Seat In Particular Orientation Present?
Determine Deployment Control Signal
345
349
Is Child Seat In Particular Position Present?
Occupant Restraint Device
348
350

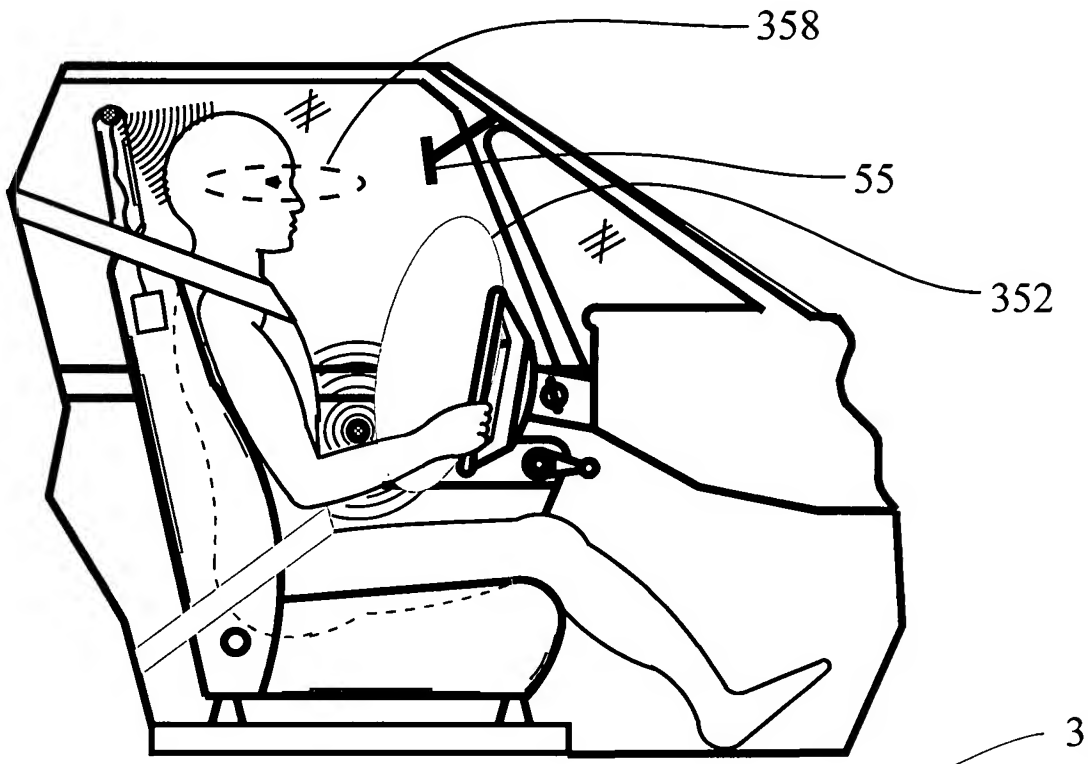


FIG. 59

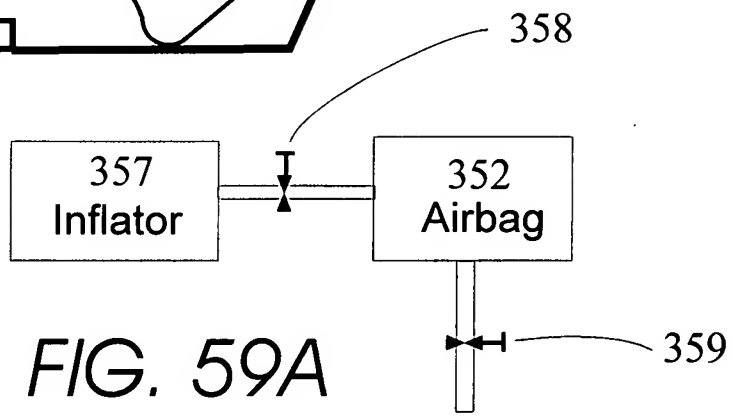


FIG. 59A

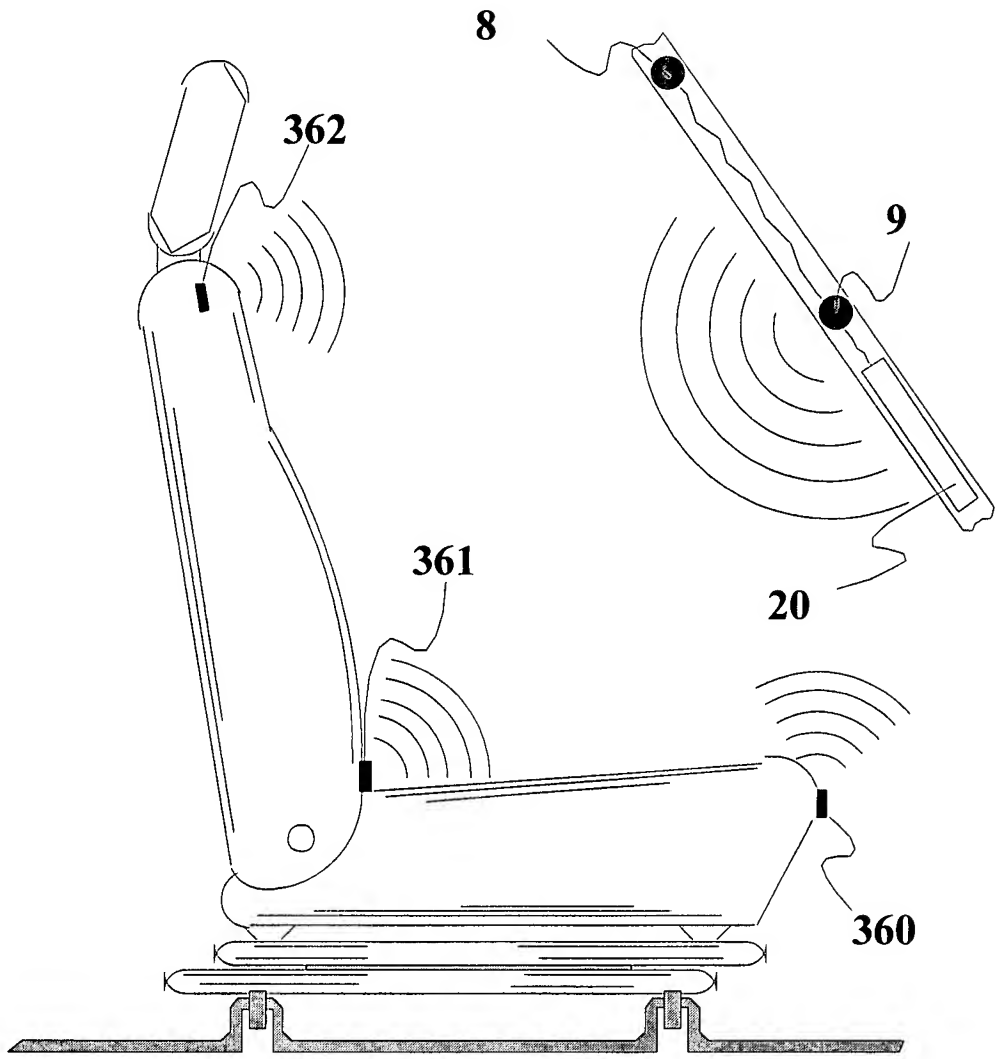


FIG. 60

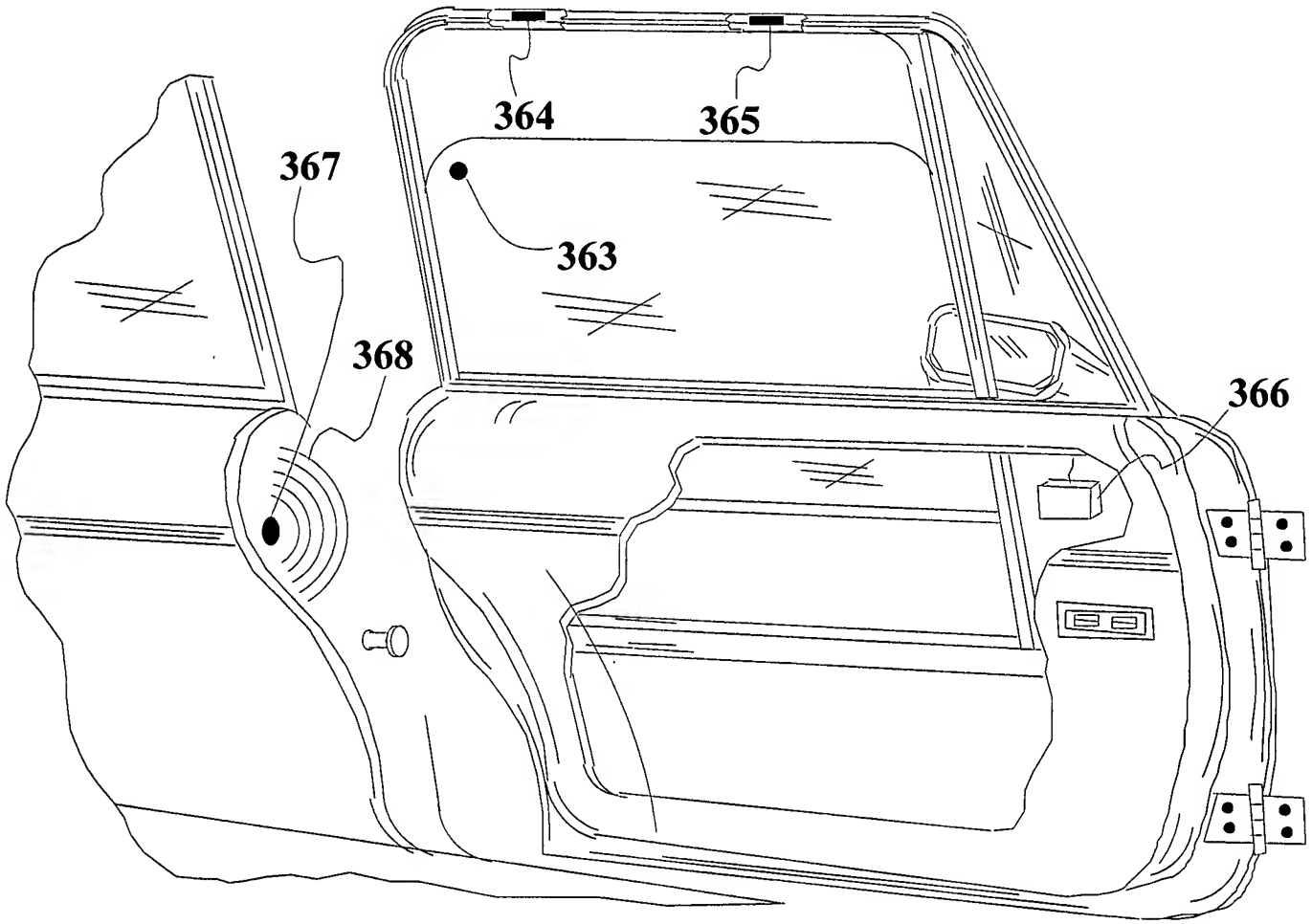


FIG. 61

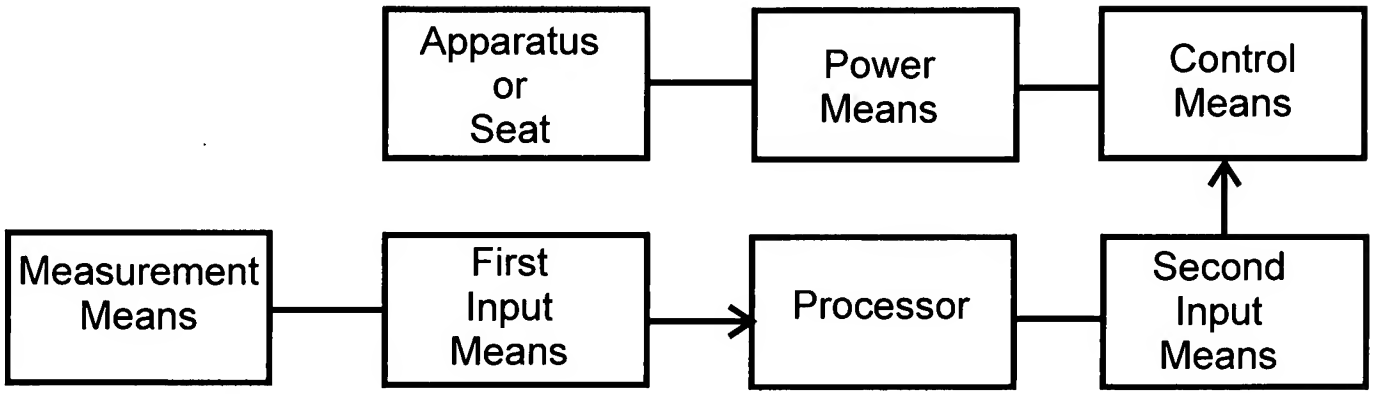


FIG. 62A

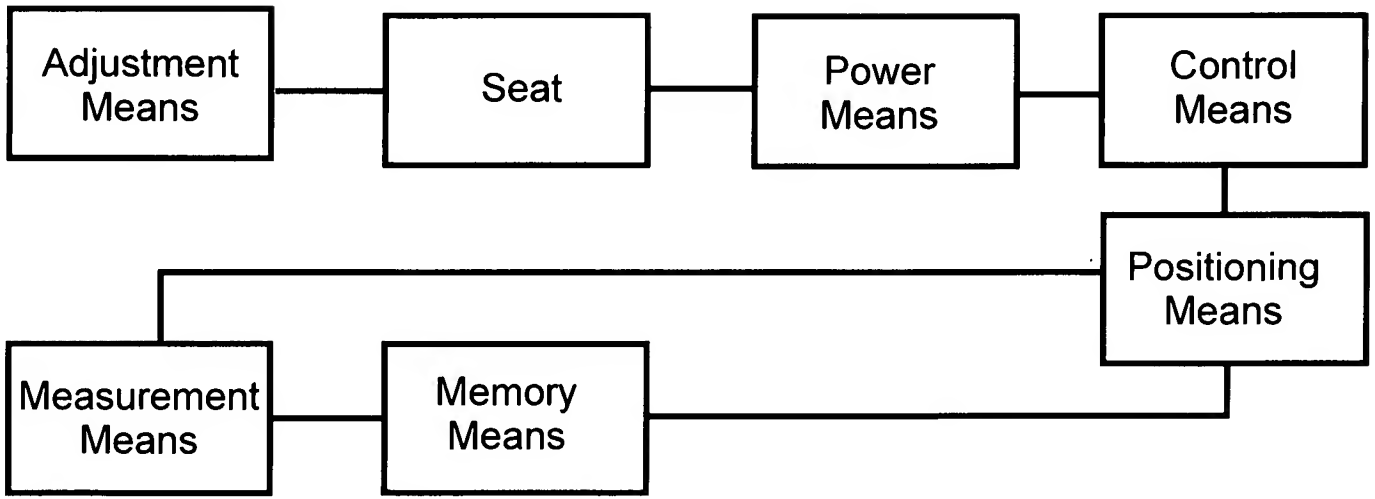


FIG. 62B

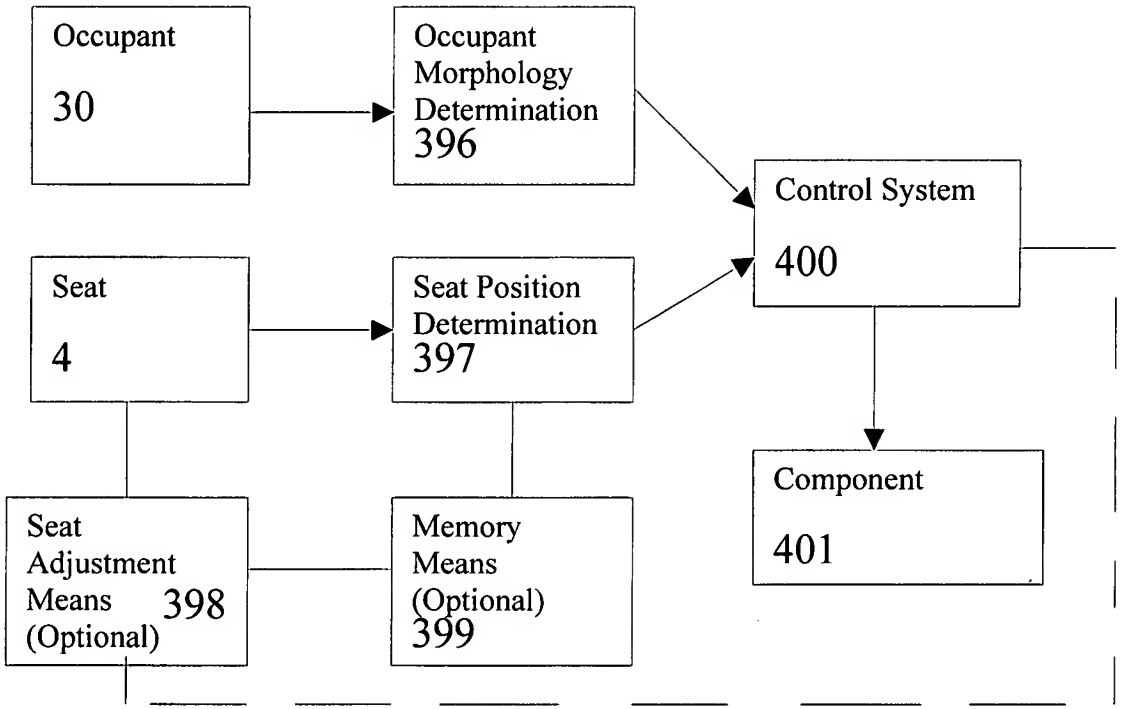

Occupant
30
Occupant Morphology Determination
396
Control System
400
Seat
4
Seat Position Determination
397
Component
401
Seat Adjustment Means (Optional)
398
Memory Means (Optional)
399

FIG. 63

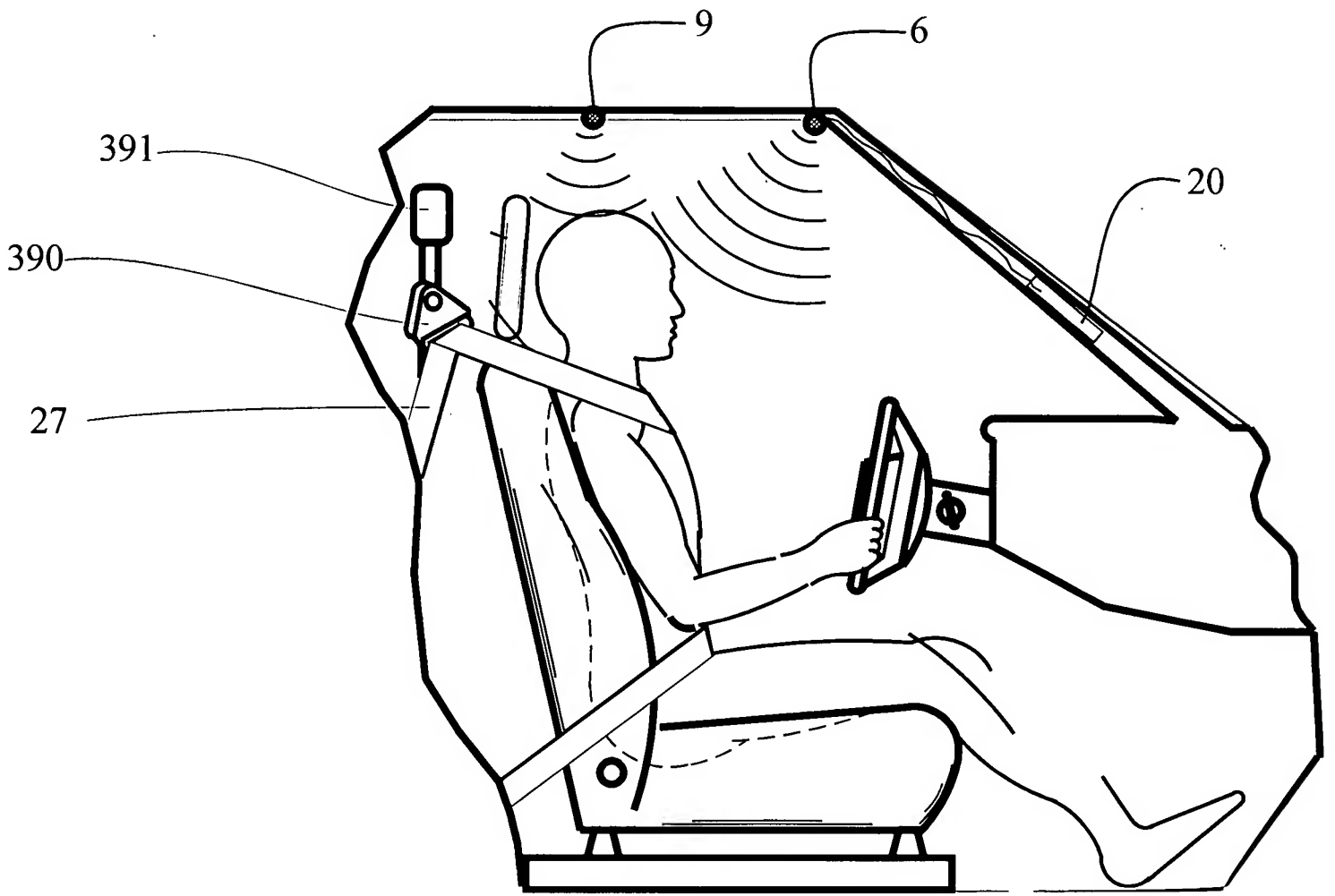


FIG. 64

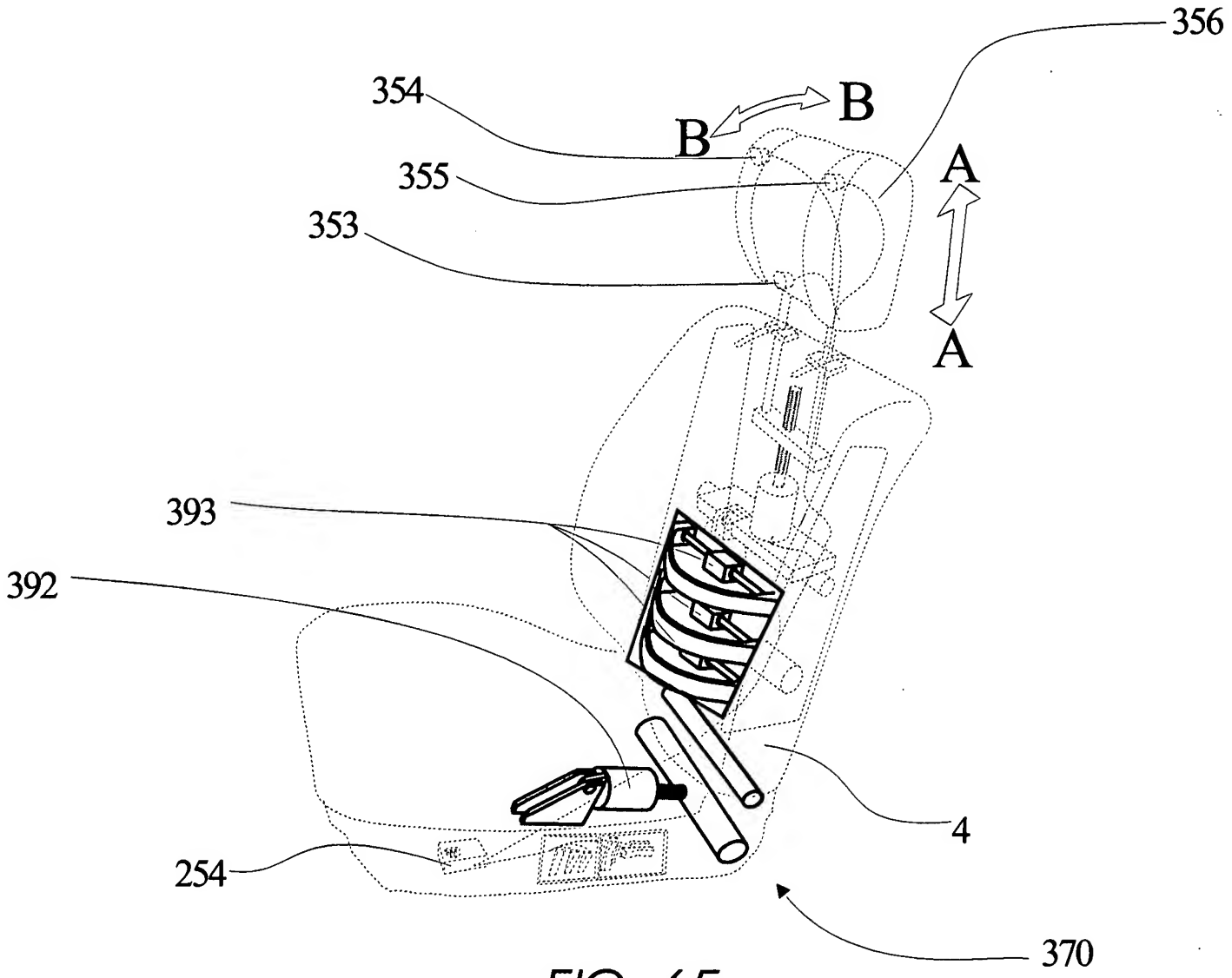


FIG. 65

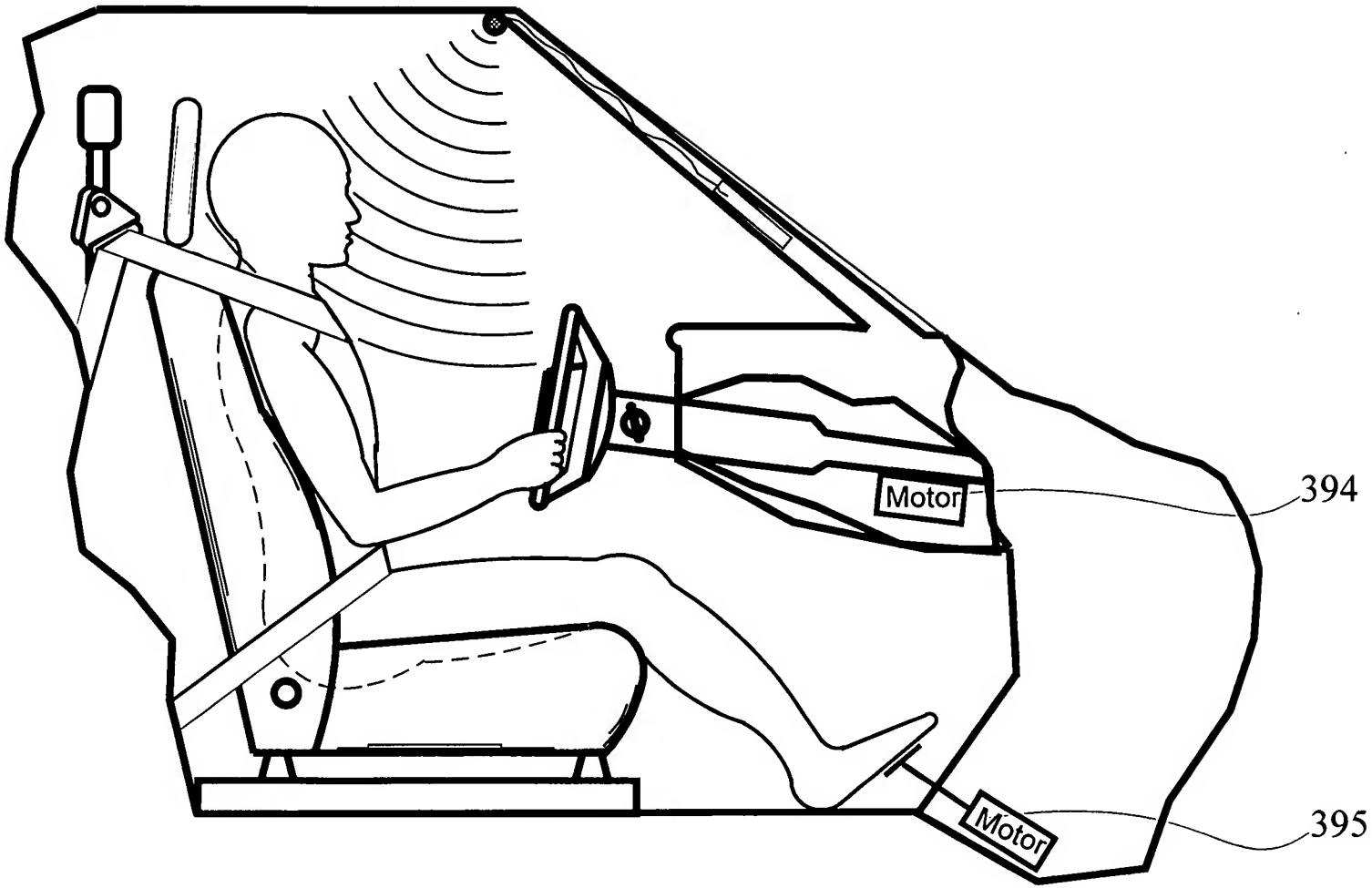


FIG. 66

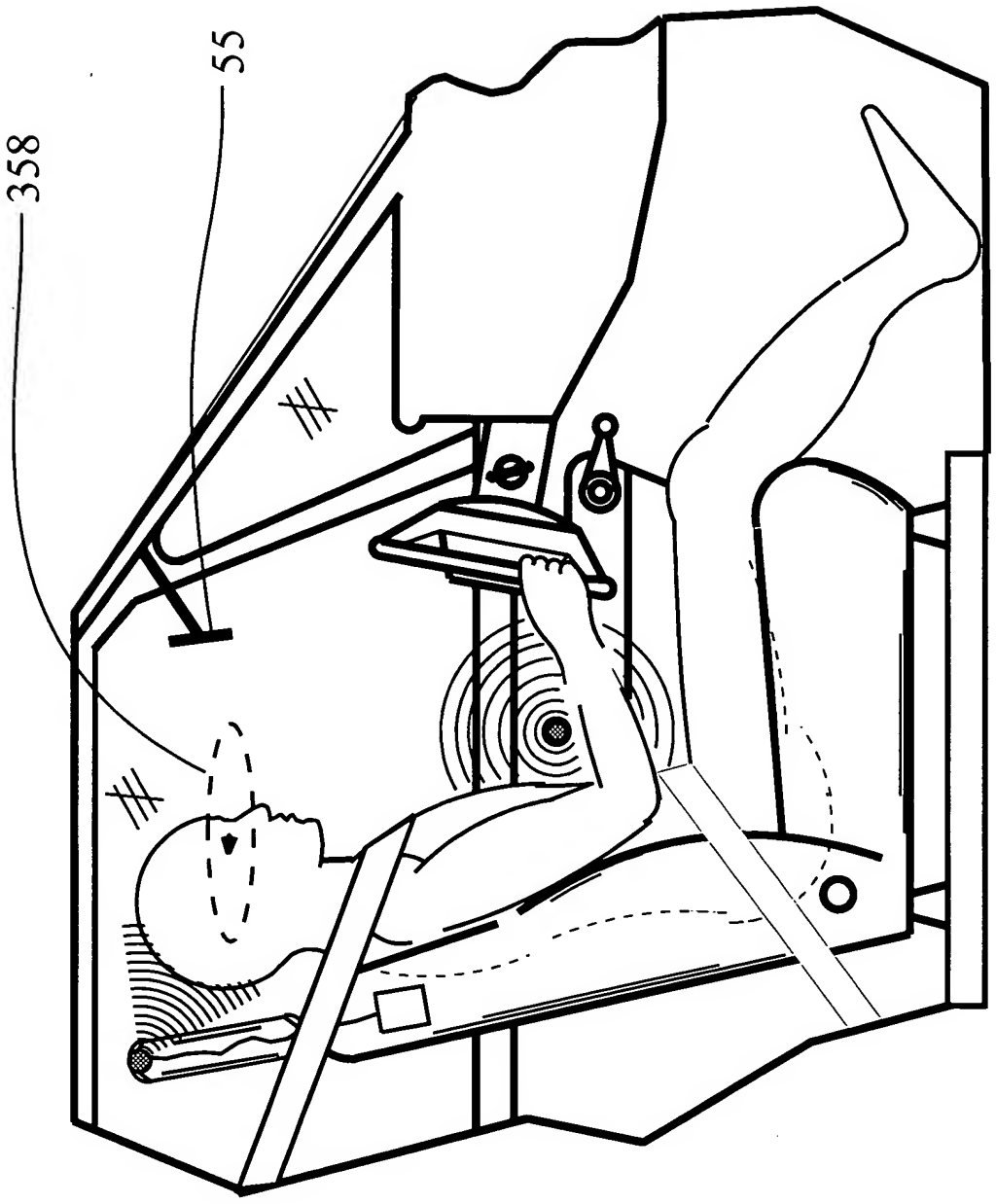


FIG. 67

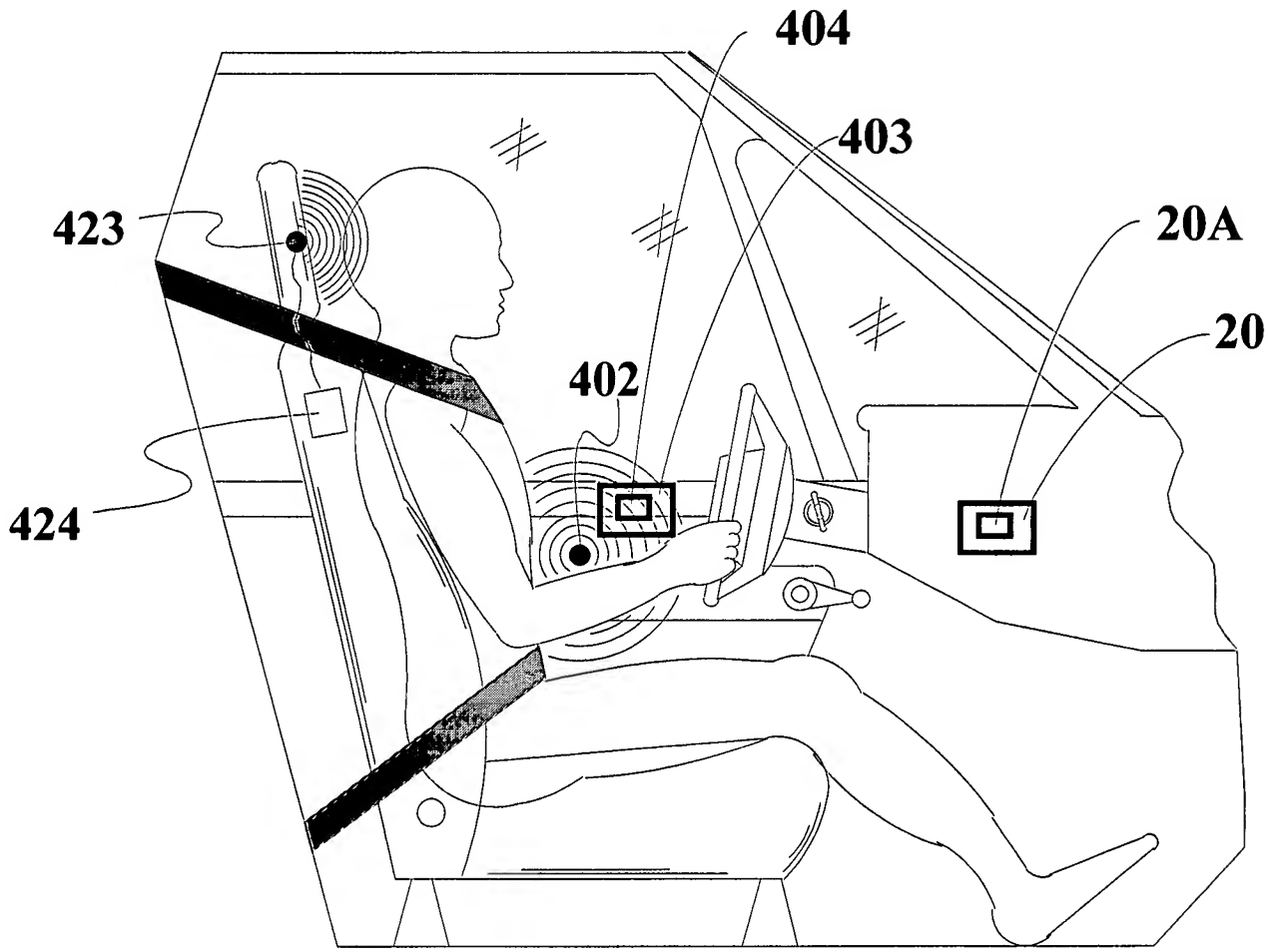


FIG. 68

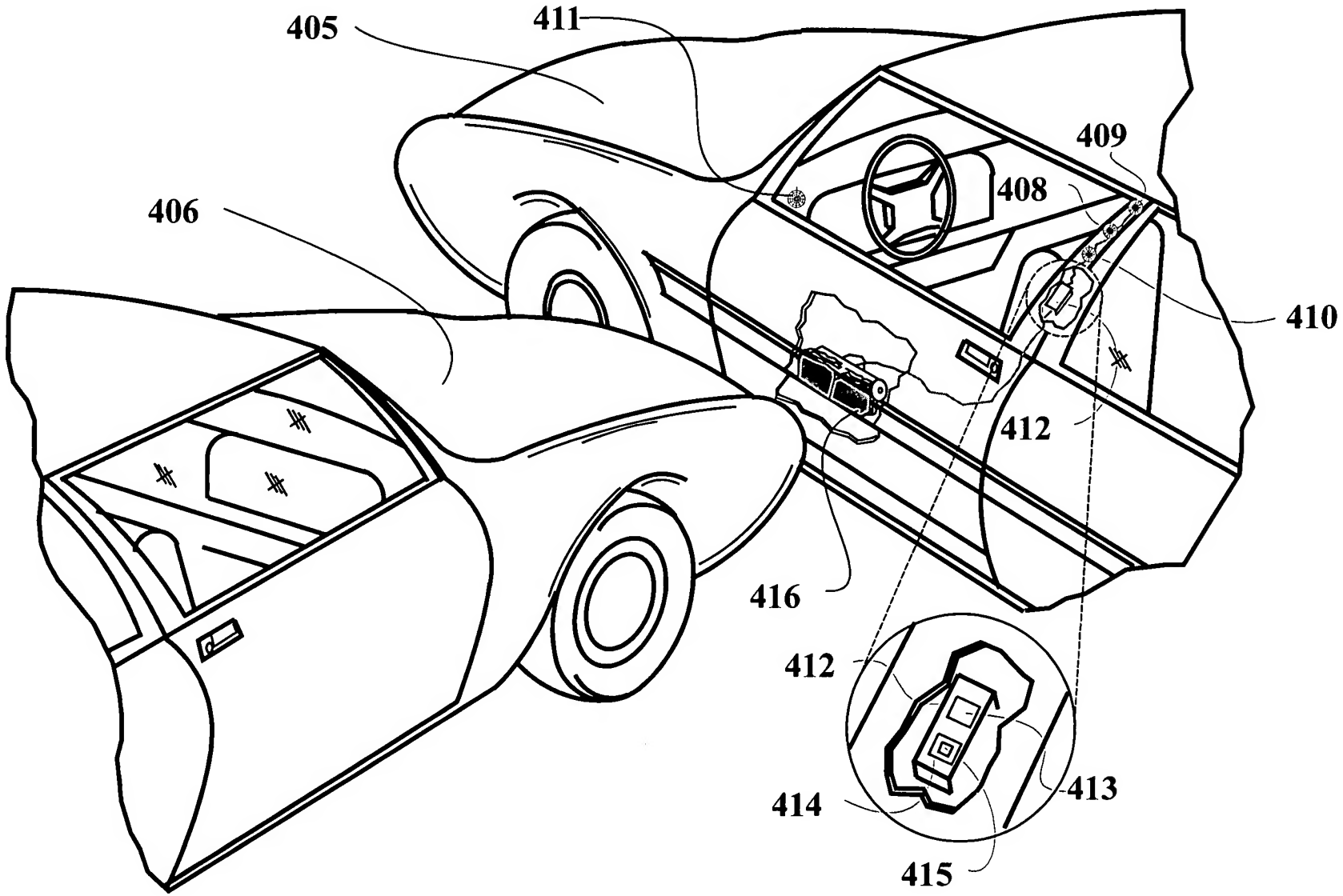


FIG. 69

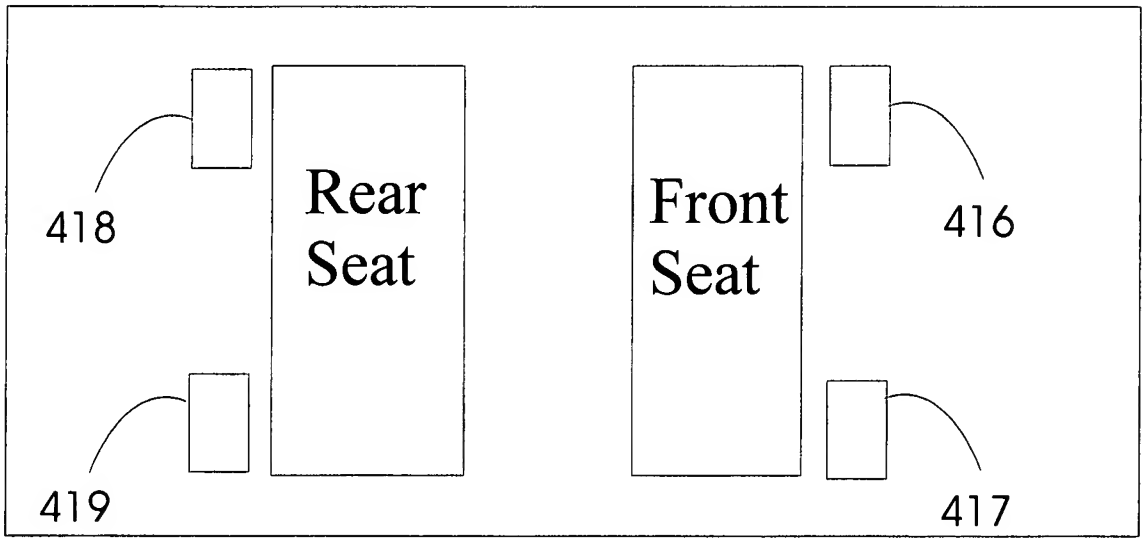


FIG. 70

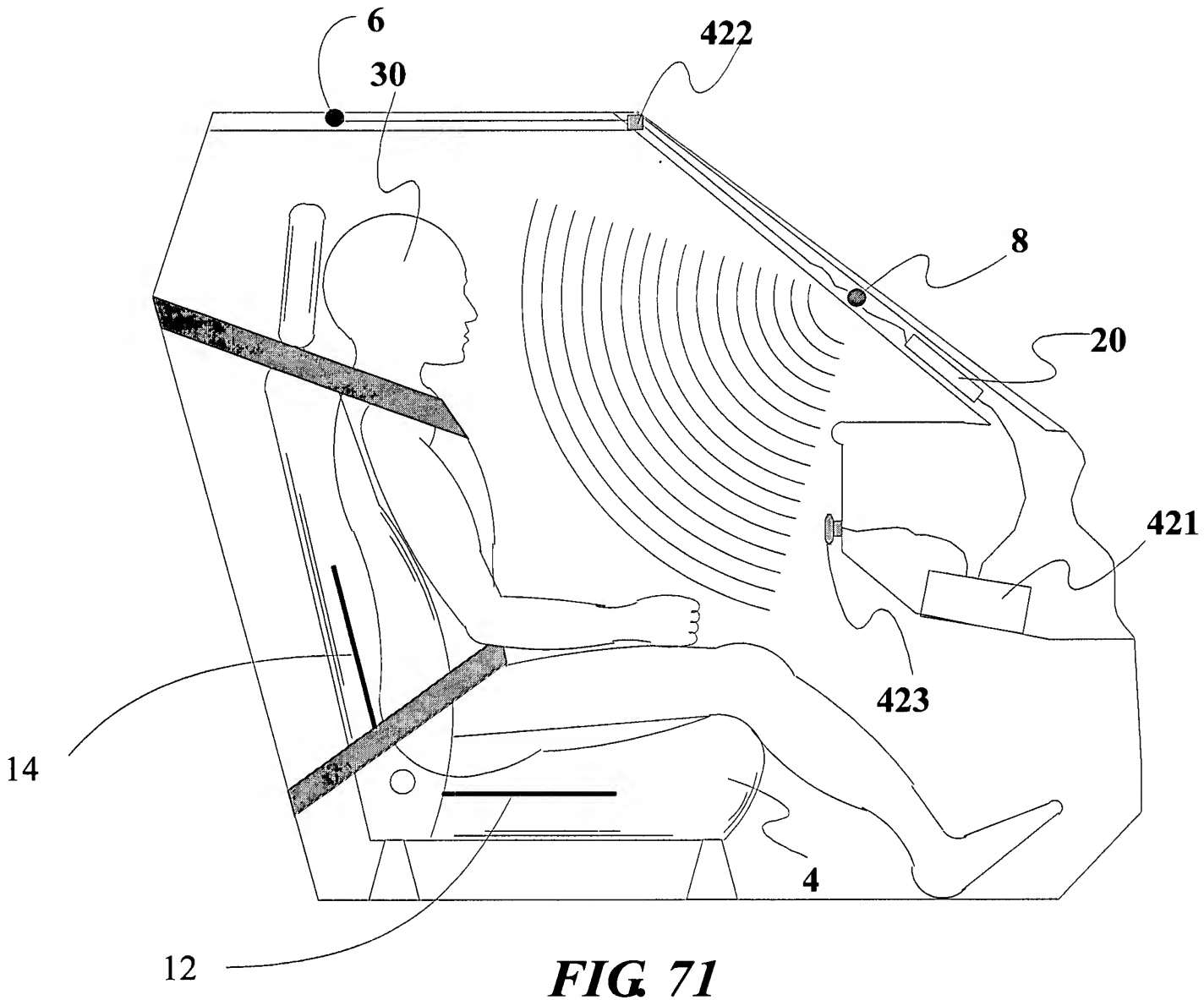


FIG. 71

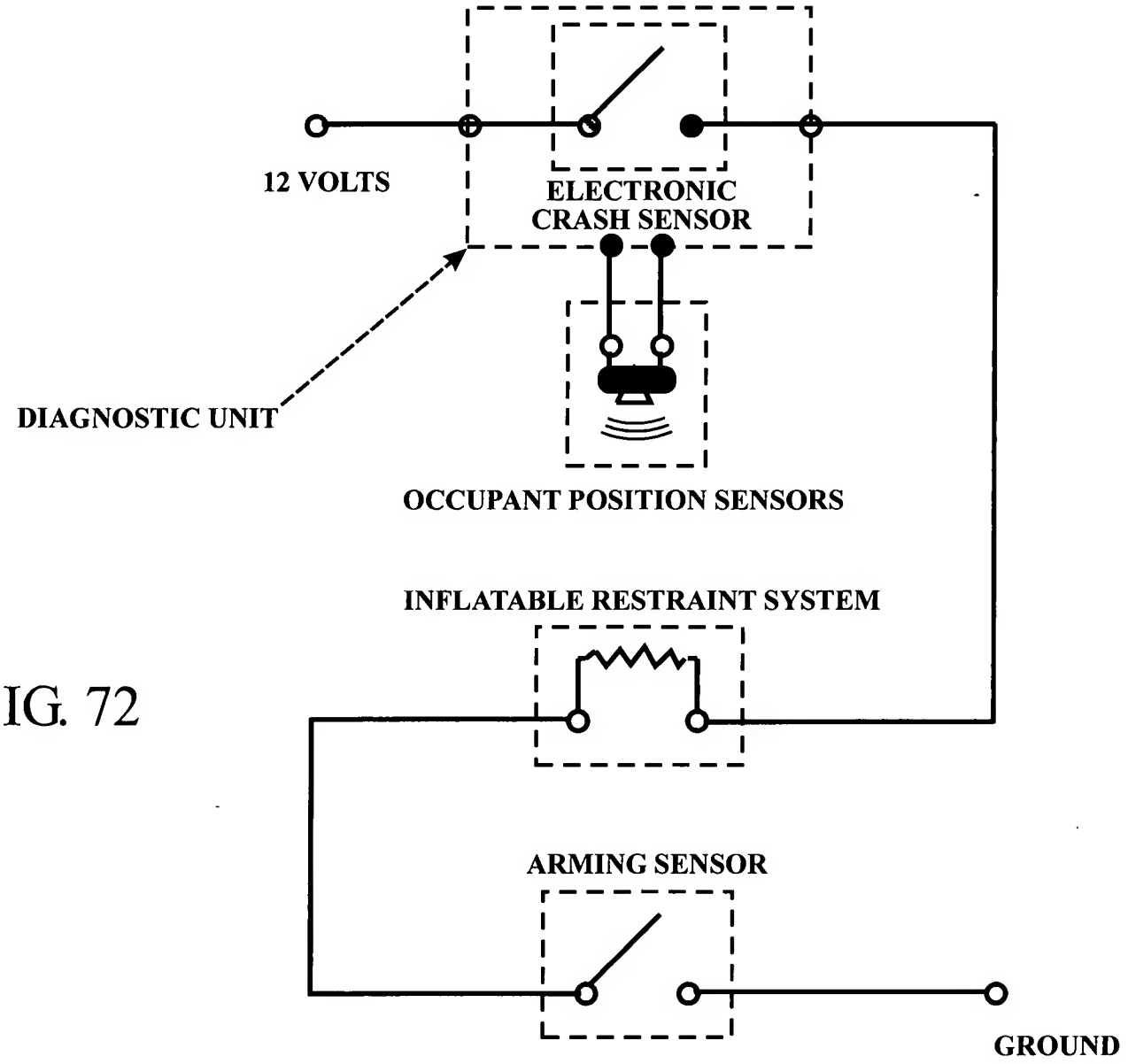

12 VOLTS
ELECTRONIC
CRASH SENSOR
DIAGNOSTIC UNIT
OCCUPANT POSITION SENSORS
INFLATABLE RESTRAINT SYSTEM
ARMING SENSOR
GROUND

FIG. 72

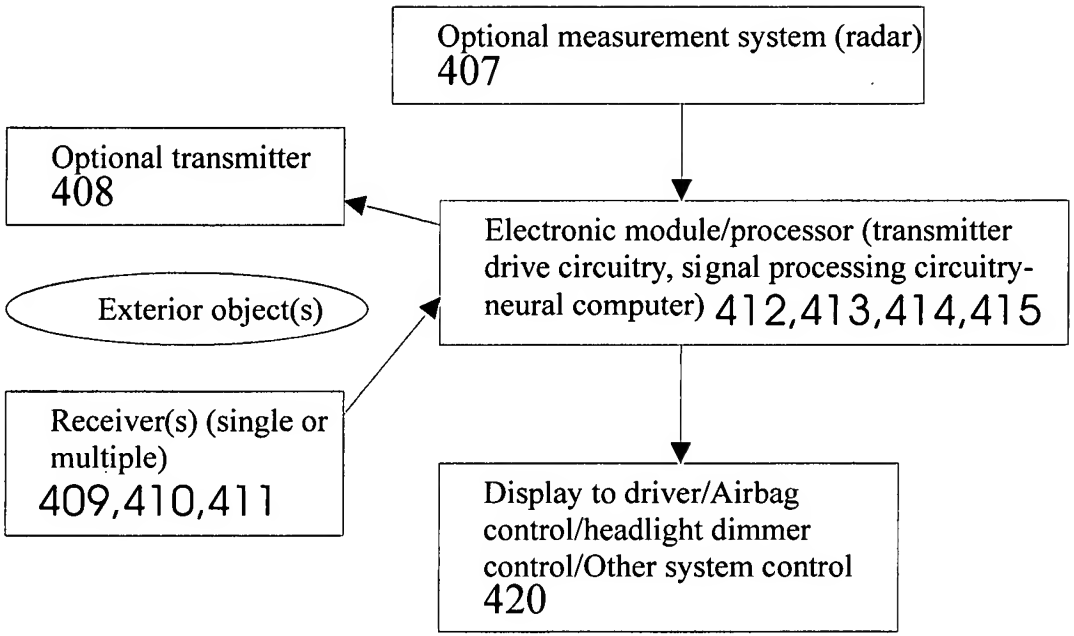

Optional measurement system (radar)
407
Optional transmitter
408
Electronic module/processor (transmitter drive circuitry, signal processing circuitry-neural computer) 412,413,414,415
Exterior object(s)
Receiver(s) (single or multiple)
409,410,411
Display to driver/Airbag control/headlight dimmer control/Other system control
420

FIG. 73

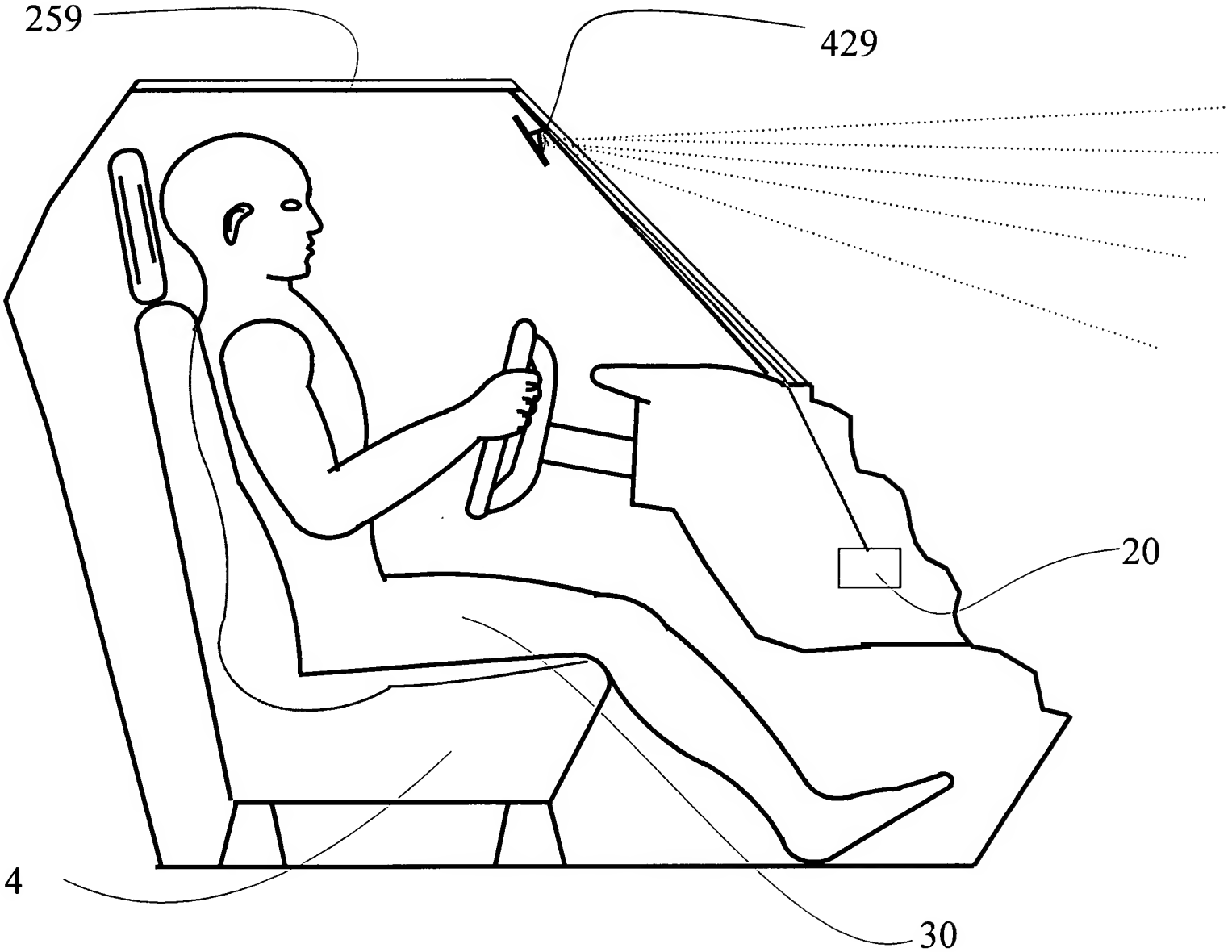


FIG. 74

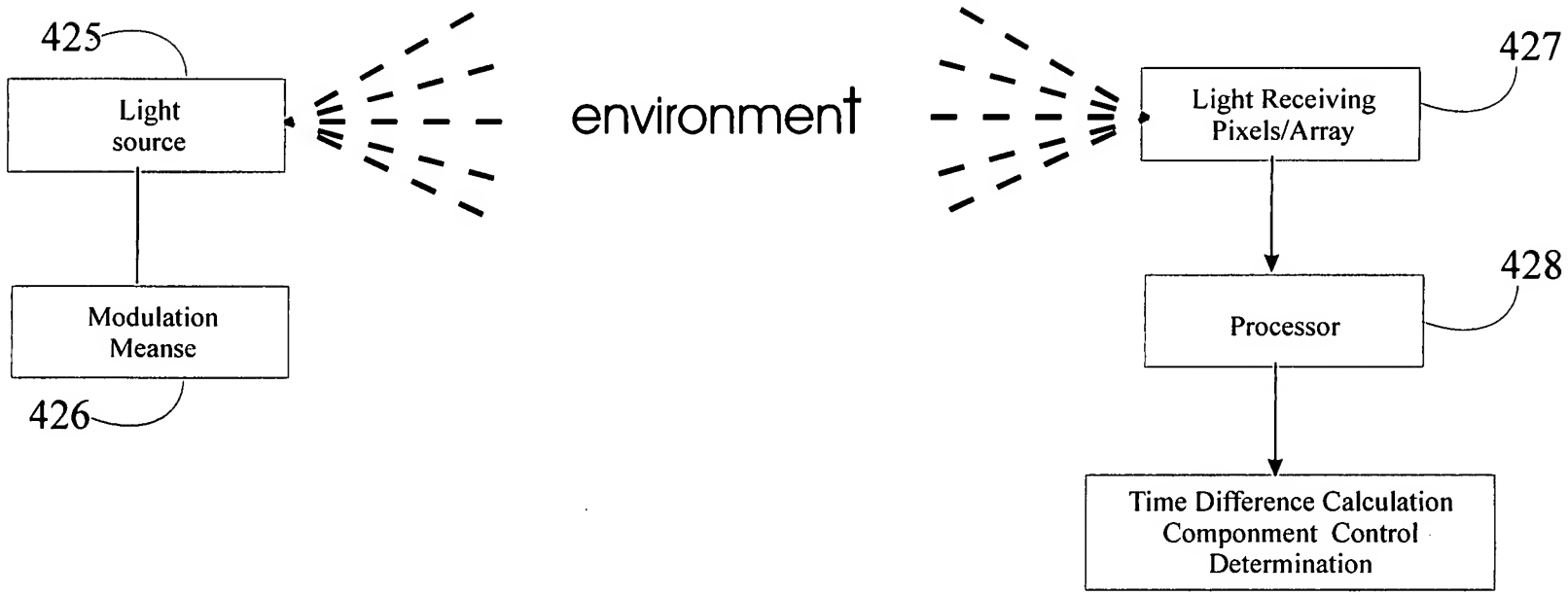

425
Light source
Modulation Meanse
426
environment
427
Light Receiving Pixels/Array
428
Processor
Time Difference Calculation Componment Control Determination

FIG. 75

Subject Classification

Class	Instances	Weight Category	State
ES	Empty Seat	<10 lb	Empty
FFA	Normally Seated Adult	> 05 lb	Enable
FFC	Normally Seated Child	<10,105> lb	Enable
FFC	Normally Positioned Forward Facing Child Seat	<10,45> lb	Enable
OOP	Out-of-position Adult	>105 lb	Disable
OOP	Out-of-position Child	<105 lb	Disable
OOP	Out-of-position Forward Facing Child Seat	<10,45> lb	Disable
RFS	Rearward Facing Child Seat	<10,45> lb	Disable
RFS	Rearward Facing Infant Seat	<10,45> lb	Disable

FIG. 76

Categorization of Human Subjects

	Weight Range kg (lb)		Height Range m (in	
Child		<0.95,1 .1 5> (<3'1",3'9">)	<1.10,1.30> (<3'7",4'3">)	<1.25,1.45> (<4'1",4'9">)
	<11,25>(<24,55>)	C11	C12	C13
	<22,36> (<48,79>)	C21	C22	C23
	<33,47> (<73,103>)	C31	C32	C33
Adult		<1 .45, 1 .65> (<49,555')	<1 .60,1 .80> (<53,51 1 '5')	<1 .75, 1 .95> (<59,655')
	<45,70>('<99,154>)	A11	A12	A13
	<65,90> (<143,198>)	A21	A22	A23
	<85,110>(<187,242>)	A31	A32	A33

All Human Subjects are to wear light clothes (typically slacks and T-shirt) on entry.
Other types of clothing to be provided by ATI

Child Surrogates

Doll		Baby=0.50m (approx. 20")	Infant=0.75m (approx. 30")	Child=1.20m (approx. 48")

FIG. 77

Rearward Facing Infant Seats

Designation	Child Seat	Attributes
Training	Arriva	base, hood
Independent	Assura565	hood
Training	Baby-Safe	-
Training	Century 590	base, hood
Training	Evenflo Discovery	base, Tbar
Training	Evenflo Joyride (new)	hood
Independent	Evenflo Joyride (old)	-
Training	GerryGuard	base
Validation	Kolcraft Travelabout	base, Tbar
Training	Rock-n-Ride	-
Training	TLC	-

FIG. 78

Rearward Facing Child Seat

Designation	Child Seat	Attributes
Training	Centuryl000	-
Validation	Century 2000 STE	-
Training	CenturyOvation	-
Training	Century Smartmove 5T	table
Training	Champion	table
Training	Fisher Price Child Seat	table
Training	Touriva	-
Training	Ultara	table
Training	Vario Exclusive	table

FIG. 79

Forward Facing Child and Booster Seats

Designation	Child Seat	Attributes
Training	Century1000	-
Validation	Century 2000 STE	-
Training	CenturyOvation	-
Validation	Century Smartmove 5T	table
Training	Champion	table
Validation	Fisher Price Booster	-
Training	Fisher Price Child Seat	table
Training	Gerry Booster	table
Training	Touriva	-
Training	Ultara	table
Training	Vario Exclusiv	table

FIG. 80

Vehicle Configuration Series

Config	Seat Track (+/1 .05")										Seatback Recline (+/- 2°)										Windows									
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
A	0	0	2	2	2	4	4	6	6	6	0	18	4	12	20	2	20	0	8	16	D	D	U	U	D	D	U	U	D	D
B	1	1	3	3	3	5	5	7	7	7	2	20	0	8	16	0	18	4	12	20	U	U	D	D	U	U	D	D	U	U
C	0	0	2	2	4	4	4	6	6	6	5	15	4	16	0	15	20	2	10	18	U	U	D	D	U	U	D	D	U	U
D	1	1	3	3	5	5	5	7	7	7	4	16	5	15	2	10	18	0	15	20	D	D	U	U	D	D	U	U	D	D
E	0	0	0	2	2	2	4	4	6	6	0	8	16	4	12	20	2	20	0	18	D	D	U	U	D	D	U	U	D	D
F	1	1	1	3	3	3	5	5	7	7	4	12	20	0	8	16	0	18	2	20	U	U	D	D	U	U	D	D	U	U
G	0	0	2	2	2	4	4	4	6	6	4	16	2	20	2	10	18	0	15	20	U	U	D	D	U	U	D	D	U	U
H	1	1	3	3	3	5	5	5	7	7	2	20	4	16	0	15	20	2	10	18	D	D	U	U	D	D	U	U	D	D

FIG. 81A

Vehicle Configuration Series

Config	Visor										Convertible Top									
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
A	U	D	U	D	S	U	D	U	D	S	U	U	U	U	U	D	D	D	D	D
B	D	U	D	U	S	D	U	D	U	S	D	D	D	D	D	U	U	U	U	U
C	U	D	S	U	D	U	D	S	U	D	D	D	D	D	D	U	U	U	U	U
D	D	U	S	D	U	D	U	S	D	U	U	U	U	U	U	D	D	D	D	D
E	D	U	D	S	D	U	D	S	U	D	U	U	U	U	U	D	D	D	D	D
F	U	D	U	S	D	U	D	S	U	D	D	D	D	D	D	U	U	U	U	U
G	U	S	D	U	D	U	D	U	S	D	D	D	D	D	D	U	U	U	U	U
H	D	S	U	D	U	D	U	D	S	U	U	U	U	U	U	D	D	D	D	D

FIG. 81B

Sequence for Child Seat Training Data Collection:

Start object in center of the seat. Trainer has both hands on the steering wheel;
With a smooth motion, push the object fully outboard, then pull it fully inboard, then push it to center position, then put hands back on the steering wheel;
With a smooth motion, rotate the object 45 degrees outboard, the rotate 45 degrees inboard, then rotate back to center, then put hands back on the steering wheel;

Sequence for Out-of-Position Forward Facing Child Seat Training Data Collection

Start with object in the center line, leaning onto the Instrument Panel;
With a smooth motion, push the object fully outboard, then pull it fully inboard, then push it to the center;
Repeat this sequence with a 1 50 mm (6") gap between the object and the Instrument Panel; Apply small (+/- 10°) rotations.
Repeat this sequence with a 300 mm (12") gap between the object and the Instrument Panel; Apply small (+/- 10°) rotations.

FIG. 81C

Sequence for Human Subject Training Data Collection:

Lean forward and outboard such that head and/or shoulders touch the Fire line;
Gently traverse inboard while carefully following the Fire line until the center of the vehicle is reached;
Lean halfway back towards the seatback and traverse outboard up against the side window. Rotate torso while doing so;
Lean back into the seat and traverse inboard towards the center. Rotate torso while doing so;
Sit back in the seat; "operate" radio controls, glove box, window, or seat controls; assume a brace posture;
Do *not* cross the Fire line with head and/or shoulders at any time.

Sequence for Out-of-Position Human Subject Training Data Collection:

Lean forward and outboard such that head and/or shoulders touch the Instrument Panel;
Gently traverse inboard towards the center console;
Move back 150 mm (6") and gently traverse back to the most outboard position;
Move back 300 mm (12") and gently traverse back to the center console;
"Operate" radio controls and glovebox while head and/or shoulders remain in front of the Fire line.

FIG. 81D

Network Training Set Collection Matrix (Vehicle E)
Rev 1.1

#	Class	Subject/Object	Attributes	Actions	Config.	Belt	Conditions
1	ES	None	None	Motions of track and recline	(A)	N.A.	Ambient
2	FFA	A22	Medium Clothes, Magazine	Motions in safe seating area	B	Yes	Ambient
3	OOP	A22	Medium Clothes	Motions in NFZ	C	No	Ambient
4	FFC	Century 1000	Infant Doll	Motions in safe seating area	D	No	Ambient
5	RFS	Century 1000	Baby Doll	Motions in entire seating area	E	No	Ambient
6	ES	None	Beaded Cover	Motions of track and recline	(F)	N.A.	Ambient
7	FFA	A11	Medium Clothes	Motions in safe seating area	G	Yes	Ambient
8	OOP	Touriva	Infant Doll, Blanket	Motions in NFZ	H	No	Ambient
9	FFC	Touriva	Infant Doll, Blanket	Motions in safe seating area	A	No	Ambient
10	RFS	Century 590	Baby Doll, Hood	Motions in entire seating area	B	No	Ambient
11	ES	None	Fabric Cover	Motions of track and recline	(C)	N.A.	Ambient
12	FFA	A33	Medium Clothes, Newspaper	Motions in safe seating area	D	No	Ambient
13	OOP	A33	Medium Clothes	Motions in NFZ	E	Yes	Ambient
14	FFC	C22	Medium Clothes	Motions in safe seating area	F	No	Ambient
15	RFS	Touriva	Baby Doll, Blanket	Motions in entire seating area	G	No	Ambient
16	ES	None	Blanket	Motions of track and recline	(H)	N.A.	Ambient
17	FFA	A21	Heavy Clothes	Motions in safe seating area	A	No	Ambient
18	OOP	C11	Heavy Clothes	Motions in NFZ (standing)	B	No	Ambient
19	FFC	C11	Heavy Clothes	Motions in safe seating area	C	No	Ambient

FIG. 82A

20	RFS	TLC	Baby Doll	Motions in entire seating area	D	No	Ambient
21	ES	None	None	Motions of track and recline	(E)	N.A.	Solar Heat
22	FFA	A12	Light Clothes, Magazine	Motions in safe seating area	F	Yes	Solar Heat
23	OOP	A12	Light Clothes	Motions in NFZ	G	No	Solar Heat
24	FFC	Champion	Infant Doll	Motions in safe seating area	H	No	Solar Heat
25	RFS	Champion	Baby Doll	Motions in entire seating area	A	No	Solar Heat
26	ES	None	Beaded Cover	Motions of track and recline	(B)	N.A.	Solar Heat
27	FFA	A23	Light Clothes	Motions in safe seating area	C	Yes	Solar Heat
28	OOP	Vario Exclusive	Child Doll	Motions in NFZ	D	No	Solar Heat
29	FFC	Vario Exclusive	Child Doll, Blanket	Motions in safe seating area	E	No	Solar Heat
30	RFS	Joyride (new)	Baby Doll	Motions in entire seating area	F	No	Solar Heat
31	ES	None	Fabric Cover	Motions of track and recline	(G)	N.A.	Solar Heat
32	FFA	A32	Light Clothes, Newspaper	Motions in safe seating area	H	No	Solar Heat
33	OOP	A32	Light Clothes	Motions in NFZ	A	Yes	Solar Heat
34	FFC	C33	Light Clothes	Motions in safe seating area	B	No	Solar Heat
35	RFS	Ultara	Baby Doll, Blanket	Motions in entire seating area	C	No	Solar Heat
36	ES	None	Blanket	Motions of track and recline	(D)	N.A.	Solar Heat
37	FFA	A22	Medium Clothes	Motions in safe seating area	E	No	Solar Heat
38	OOP	C21	Medium Clothes	Motions in NFZ	F	No	Solar Heat
39	FFC	C21	Medium Clothes	Motions in safe seating area	G	No	Solar Heat
40	RFS	Arriva	Baby Doll, Hood	Motions in entire seating area	H	No	Solar Heat
41	ES	None	Handbag	Motions of track and recline	(H)	N.A.	Ambient
42	FFA	A11	Heavy Clothes, Magazine	Motions in safe seating area	G	Yes	Ambient

FIG. 82B

43	OOP	A11	Heavy Clothes	Motions in NFZ	F	No	Ambient
44	FFC	Gerry Booster	Infant Doll	Motions in safe seating area	E	No	Ambient
45	RFS	Fisher Price CS	Baby Doll	Motions in entire seating area	D	No	Ambient
46	ES	None	Beaded Cover, Handbag	Motions of track and recline	(C)	N.A.	Ambient
47	FFA	A33	Heavy Clothes	Motions in safe seating area	B	Yes	Ambient
48	OOP	Ultara	Inflant Doll, Blanket	Motions in NFZ	A	No	Ambient
49	FFC	Ultara	Inflant Doll, Blanket	Motions in safe seating area	H	No	Ambient
50	RFS	Baby Safe	Baby Doll, Handle up	Motions in entire seating area	G	No	Ambient
51	ES	None	Fabric Cover, Handbag	Motions of track and recline	(F)	N.A.	Ambient
52	FFA	A21	Heavy Clothes, Newspaper	Motions in safe seating area	E	No	Ambient
53	OOP	A21	Heavy Clothes	Motions in NFZ	D	Yes	Ambient
54	FFC	C12	Heavy Clothes	Motions in safe seating area	C	No	Ambient
55	RFS	Vario Exclusive	Baby Doll, Blanket	Motions in entire seating area	B	No	Ambient
56	ES	None	Blanket, Handbag	Motions of track and recline	(A)	N.A.	Ambient
57	FFA	A12	Rain Clothes	Motions in safe seating area	H	No	Ambient
58	OOP	C23	Rain Clothes	Motions in NFZ	G	No	Ambient
59	FFC	C23	Rain Clothes	Motions in safe seating area	F	No	Ambient
60	RFS	Rock'n'Ride	Baby Doll	Motions in entire seating area	E	No	Ambient
61	ES	None	None	Motions of track and recline	(D)	N.A.	Air Conditioner
62	FFA	A23	Light Clothes, Magazine	Motions in safe seating area	C	Yes	Air Conditioner

FIG. 82C

63	OOP	A23	Light Clothes	Motions in NFZ	B	No	Air Conditioner
64	FFC	Century Ovation	Inflant Doll	Motions in safe seating area	A	No	Air Conditioner
65	RFS	Century Ovation	Baby Doll	Motions in entire seating area	H	No	Air Conditioner
66	ES	None	Beaded Cover	Motions of track and recline	(G)	N.A.	Air Conditioner
67	FFA	A32	Light Clothes	Motions in safe seating area	F	Yes	Air Conditioner
68	OOP	Fisher Price CS	Child Doll	Motions in NFZ	E	No	Air Conditioner
69	FFC	Fisher Price CS	Child Doll, Blanket	Motions in safe seating area	D	No	Air Conditioner
70	RFS	Gerry Guard	Baby Doll	Motions in entire seating area	C	No	Air Conditioner
71	ES	None	Fabric Cover	Motions of track and recline	(B)	N.A.	Air Conditioner
72	FFA	A22	Light Clothes, Newspaper	Motions in safe seating area	A	No	Air Conditioner
73	OOP	A22	Light Clothes	Motions in NFZ	H	Yes	Air Conditioner
74	FFC	C32	Light Clothes	Motions in safe seating area	G	No	Air Conditioner
75	RFS	Smartmove 5T	Baby Doll, Blanket	Motions in entire seating area	F	No	Air Conditioner
76	ES	None	Blanket	Motions of track and recline	(E)	N.A.	Air Conditioner
77	FFA	A11	Medium Clothes	Motions in safe seating area	D	No	Air Conditioner
78	OOP	C22	Medium Clothes	Motions in NFZ	C	No	Air Conditioner
79	FFC	C22	Medium Clothes	Motions in safe seating area	B	No	Air Conditioner
80	RFS	Discovery	Baby Doll, Handle up	Motions in entire seating area	A	No	Air Conditioner
81	ES	None	Pizza Box	Motions of track and recline	(B)	N.A.	Ambient
82	FFA	A33	Rain Clothes, Magazine	Motions in safe seating area	A	Yes	Ambient
83	OOP	A33	Rain Clothes	Motions in NFZ	D	Yes	Ambient
84	FFC	Champion	Infant Doll	Motions in safe seating area	C	No	Ambient

FIG. 82D

85	RFS	Champion	Baby Doll	Motions in entire seating area	F	No	Ambient
86	ES	None	Beaded Cover, Pizza Box	Motions of track and recline	(E)	N.A.	Ambient
87	FFA	A21	Rain Clothes	Motions in safe seating area	H	Yes	Ambient
88	OOP	Vario Exclusive	Child Doll, Blanket	Motions in NFZ	G	No	Ambient
89	FFC	Vario Exclusive	Child Doll, Blanket	Motions in safe seating area	B	No	Ambient
90	RFS	Joyride (new)	Baby Doll, Hood	Motions in entire seating area	A	No	Ambient
91	ES	None	Fabric Cover, Pizza Box	Motions of track and recline	(D)	N.A.	Ambient
92	FFA	A12	Rain Clothes, Newspaper	Motions in safe seating area	C	No	Ambient
93	OOP	A12	Rain Clothes	Motions in NFZ	F	No	Ambient
94	FFC	C23	Rain Clothes	Motions in safe seating area	E	No	Ambient
95	RFS	Ultara	Baby Doll, Blanket	Motions in entire seating area	H	No	Ambient
96	ES	None	Blanket, Pizza Box	Motions of track and recline	(G)	N.A.	Ambient
97	FFA	A23	Light Clothes	Motions in safe seating area	B	No	Ambient
98	OOP	C32	Light Clothes	Motions in NFZ	A	No	Ambient
99	FFC	C32	Light Clothes	Motions in safe seating area	D	No	Ambient
100	RFS	Arriva	Baby Doll, Hood	Motions in entire seating area	C	No	Ambient
101	ES	None	None	Motions of track and recline	(F)	N.A.	Car Heat
102	FFA	A32	Light Clothes, Magazine	Motions in safe seating area	E	Yes	Car Heat
103	OOP	A32	Light Clothes	Motions in NFZ	H	Yes	Car Heat
104	FFC	Century 1000	Infant Doll	Motions in safe seating area	G	No	Car Heat
105	RFS	Century 1000	Baby Doll	Motions in entire seating area	B	No	Car Heat
106	ES	None	Beaded Cover	Motions of track and recline	(A)	N.A.	Car Heat

FIG. 82E

107	FFA	A22	Rain Clothes	Motions in safe seating area	D	Yes	Car Heat
108	OOP	Vario Exclusive	Inflant Doll	Motions in NFZ	C	No	Car Heat
109	FFC	Touriva	Inflant Doll, Blanket	Motions in safe seating area	F	No	Car Heat
110	RFS	Century 590	Baby Doll	Motions in entire seating area	E	No	Car Heat
111	ES	None	Fabric Cover	Motions of track and recline	(H)	N.A.	Car Heat
112	FFA	A11	Light Clothes, Newspaper	Motions in safe seating area	G	No	Car Heat
113	OOP	A11	Light Clothes	Motions in NFZ	B	No	Car Heat
114	FFC	C32	Light Clothes	Motions in safe seating area	A	No	Car Heat
115	RFS	Touriva	Baby Doll, Blanket	Motions in entire seating area	D	No	Car Heat
116	ES	None	Blanket	Motions of track and recline	(C)	N.A.	Car Heat
117	FFA	A33	Heavy Clothes	Motions in safe seating area	F	No	Car Heat
118	OOP	C22	Heaby Clothes	Motions in NFZ	E	No	Car Heat
119	FFC	C22	Heavy Clothes	Motions in safe seating area	H	No	Car Heat
120	RFS	TLC	Baby Doll	Motions in entire seating area	G	No	Car Heat
121	ES	None	Attaché Case (flat)	Motions of track and recline	(G)	N.A.	Ambient
122	FFA	A21	Heavy Clothes, Magazine	Motions in safe seating area	H	Yes	Ambient
123	OOP	A21	Heavy Clothes	Motions in NFZ	E	Yes	Ambient
124	FFC	Century Ovation	Infant Doll	Motions in safe seating area	F	No	Ambient
125	RFS	Century Ovation	Baby Doll	Motions in entire seating area	C	No	Ambient
126	ES	None	Beaded Cover, Attaché Case	Motions of track and recline	(D)	N.A.	Ambient
127	FFA	A12	Rain Clothes	Motions in safe seating area	A	Yes	Ambient
128	OOP	Fisher Price CS	Inflant Doll, Blanket	Motions in NFZ	B	No	Ambient

FIG. 82F

129	FFC	Fisher Price CS	Inflant Doll	Motions in safe seating area	G	No	Ambient
130	RFS	Gerry Guard	Baby Doll, Handle up	Motions in entire seating area	H	No	Ambient
131	ES	None	Fabric Cover, Attaché Case	Motions of track and recline	(E)	N.A.	Ambient
132	FFA	A23	Heavy Clothes, Newspaper	Motions in safe seating area	F	No	Ambient
133	OOP	A23	Heavy Clothes	Motions in NFZ	C	No	Ambient
134	FFC	C11	Heavy Clothes	Motions in safe seating area	D	No	Ambient
135	RFS	Smartmove 5T	Baby Doll, Blanket	Motions in entire seating area	A	No	Ambient
136	ES	None	Blanket, Attaché Case	Motions of track and recline	(B)	N.A.	Ambient
137	FFA	A32	Rain Clothes	Motions in safe seating area	G	No	Ambient
138	OOP	C33	Rain Clothes	Motions in NFZ	H	No	Ambient
139	FFC	C33	Rain Clothes	Motions in safe seating area	E	No	Ambient
140	RFS	Discovery	Baby Doll, Handle up	Motions in entire seating area	F	No	Ambient
141	ES	None	Hand Bag	Motions of track and recline	(C)	N.A.	Solar Heat
142	FFA	A22	Medium Clothes, Magazine	Motions in safe seating area	D	Yes	Solar Heat
143	OOP	A22	Heavy Clothes	Motions in NFZ	A	Yes	Solar Heat
144	FFC	Gerry Booster	Child Doll	Motions in safe seating area	B	No	Solar Heat
145	RFS	Fisher Price CS	Baby Doll	Motions in entire seating area	G	No	Solar Heat
146	ES	None	Beaded Cover, Hand Bag	Motions of track and recline	(H)	N.A.	Solar Heat

FIG. 82G

147	FFA	A11	Medium Clothes	Motions in safe seating area	E	Yes	Solar Heat
148	OOP	Vario Exclusive	Inflant Doll	Motions in NFZ	F	No	Solar Heat
149	FFC	Ultara	Inflant Doll, Blanket	Motions in safe seating area	C	No	Solar Heat
150	RFS	Baby Safe	Baby Doll	Motions in entire seating area	D	No	Solar Heat
151	ES	None	Fabric Cover, Hand Bag	Motions of track and recline	(A)	N.A.	Solar Heat
152	FFA	A33	Medium Clothes, Newspaper	Motions in safe seating area	B	No	Solar Heat
153	OOP	A33	Medium Clothes	Motions in NFZ	G	No	Solar Heat
154	FFC	C33	Medium Clothes	Motions in safe seating area	H	No	Solar Heat
155	RFS	Vario Exclusive	Baby Doll, Blanket	Motions in entire seating area	E	No	Solar Heat
156	ES	None	Blanket, Hand Bag	Motions of track and recline	(F)	N.A.	Solar Heat
157	FFA	A21	Light Clothes	Motions in safe seating area	C	No	Solar Heat
158	OOP	C21	Light Clothes	Motions in NFZ	D	No	Solar Heat
159	FFC	C21	Light Clothes	Motions in safe seating area	A	No	Solar Heat
160	RFS	Rock'n'Ride	Baby Doll	Motions in entire seating area	B	No	Solar Heat

FIG. 82H

Network Independent Test Set Collection Matrix (Vehicle E)

Rev 1.1 (Under Construction)

#	Class	Subject/ Object	Attributes	Actions	Config.	Belt	Conditions
1	ES			Motions of track and recline	(A)	N.A.	Ambient
2	FFA			Motions in safe seating area	B	Yes	Ambient
3	OOP			Motions in NFZ	C	No	Ambient
4	FFC			Motions in safe seating area	D	No	Ambient
5	RFS			Motions in entire seating area	E	No	Ambient
6	ES			Motions of track and recline	(F)	N.A.	Ambient
7	FFA			Motions in safe seating area	G	Yes	Ambient
8	OOP			Motions in NFZ	H	No	Ambient
9	FFC			Motions in safe seating area	A	No	Ambient
10	RFS			Motions in entire seating area	B	No	Ambient
11	ES			Motions of track and recline	(C)	N.A.	Ambient
12	FFA			Motions in safe seating area	D	No	Ambient
13	OOP			Motions in NFZ	E	Yes	Ambient
14	FFC			Motions in safe seating area	F	No	Ambient
15	RFS			Motions in entire seating area	G	No	Ambient
16	ES			Motions of track and recline	(H)	N.A.	Ambient
17	FFA			Motions in safe seating area	A	No	Ambient
18	OOP			Motions in NFZ (standing)	B	No	Ambient
19	FFC			Motions in safe seating area	C	No	Ambient
20	RFS			Motions in entire seating area	D	No	Ambient

FIG. 83

CHARACTERISTICS OF THE DATA SETS

DATA SET	CONFIGURATIONS	SETUPS	VECTORS
TRAINING	130	1300	650,000
INDEPENDENT TEST	130	1300	195,000
VALIDATION	100	100	15,000

FIG. 84

DISTRIBUTION OF MAIN TRAINING SUBJECTS

OCCUPANCY	REPRESENTATION
EMPTY SEAT	10 %
HUMAN OCCUPANT	32 %
CHILD SEAT	58 %

FIG. 85

CHILD SEAT DISTRIBUTION

CHILD SEAT CONFIGURATION	REPRESENTATION
FORWARD FACING CHILD SEAT	40 %
FORWARD FACING CHILD SEAT OUT - OF-POSITION	4 %
REARWARD FACING CHILD SEAT	27 %
REARWARD FACING INFANT SEAT	29 %

FIG. 86

DISTRIBUTION OF ENVIRONMENTAL CONDITIONS

ENVIRONMENTAL CONDITION	REPRESENTATION
AMBIENT	56 %
STATIC HEAT (SOLAR LAMP)	25 %
DYNAMIC HEAT (CAR HEAT)	13 %
DYNAMIC COOLING (CAR A C)	6 %

FIG. 87

VALIDATION DATA DISTRIBUTION

OCCUPANCY	REPRESENTATION
EMPTY SEAT	8 %
HUMAN OCCUPANT	39 %
CHILD SEAT	53 %

FIG. 88

HUMAN SUBJECT DISTRIBUTION

HUMAN OCCUPANT	REPRESENTATION	NORMALLY SEATED	OUT-OF-POSITION
CHILD AGE 3	15 %	50 %	50 %
CHILD AGE 6	15 %	50 %	50 %
ADULT 5 TH PERCENTILE FEMALE	23 %	67 %	33 %
ADULT 50 TH PERCENTILE MALE	23 %	67 %	33 %
ADULT 95 TH PERCENTILE MALE	23 %	67 %	33 %

FIG. 89

CHILD SEAT DISTRIBUTION

CHILD SEAT CONFIGURATION	REPRESENTATION
FORWARD FACING CHILD SEAT	11 %
FORWARD FACING BOOSTER SEAT	11 %
REARWARD FACING CHILD SEAT	38 %
REARWARD FACING INFANT SEAT	40 %

FIG. 90

DISTRIBUTION OF ENVIRONMENTAL CONDITIONS

ENVIRONMENTAL CONDITION	REPRESENTATION
AMBIENT	63 %
STATIC HEAT (SOLAR LAMP)	13 %
DYNAMIC HEAT (CAR HEAT)	12 %
DYNAMIC COOLING (CAR AIR CONDITIONER)	12 %

FIG. 91

TRANSDUCER VOLUME

TRANS-DUCER	STARTING POINT			END POINT		
	SAMPLE	TIME (MS)	DISTANCE (MM)	SAMPLE	TIME (MS)	DISTANCE (MM)
A	5	0.83	142	29	4.84	822
B	3	0.50	85	35	5.84	992
C	7	1.17	198	34	5.67	964
H	2	0.33	57	32	5.34	907

FIG. 92

BASELINE NETWORK PERFORMANCE

SELF TEST SUCCESS RATE	95.3 %
INDEPENDENT TEST SUCCESS RATE	94.5 %
VALIDATION TEST SUCCESS RATE	92.7 %

FIG. 93

PERFORMANCE PER OCCUPANCY SUBSET

OCCUPANCY	INDEPENDENT TEST
EMPTY SEAT	96.1 %
NORMALLY SEATED ADULT	92.1 %
REARWARD FACING CHILD/INFANT SEAT	94.1 %
FORWARD FACING CHILD SEAT	96.9 %
OUT-OF-POSITION HUMAN/FFCS	93.0 %

FIG. 94

PERFORMANCE PER ENVIRONMENTAL CONDITIONS SUBSET

ENVIRONMENTAL CONDITION	INDEPENDENT TEST
AMBIENT	95.4 %
LONG TERM HEAT (LAMP HEAT)	95.2 %
SORT TERM HEATING/COOLING (HVAC)	93.5 %

FIG. 95

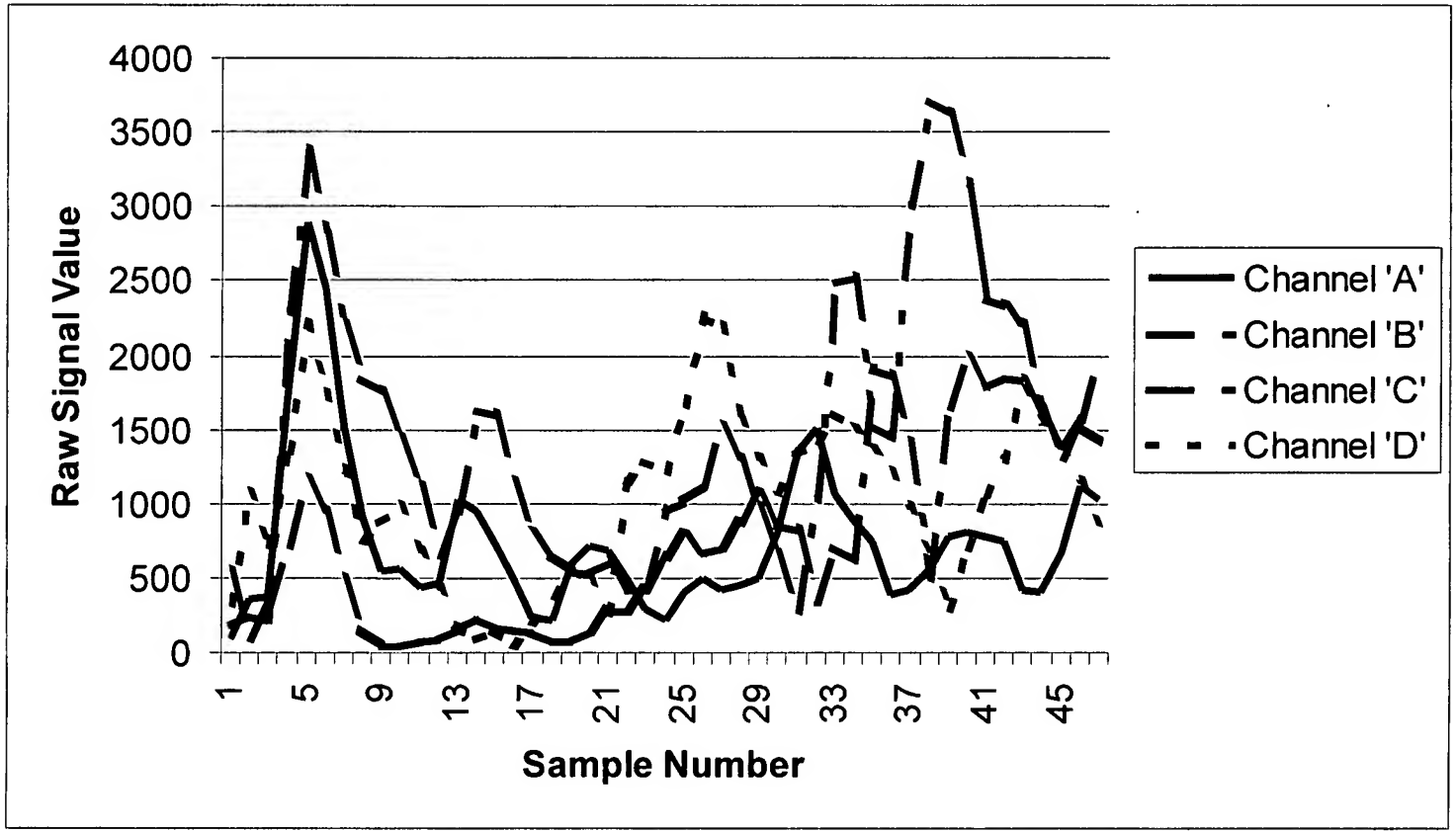

4000
3500
3000
2500
2000
1500
1000
500
0
Raw Signal Value
1
5
9
13
17
21
25
29
33
37
41
45
Sample Number
Channel 'A'
Channel 'B'
Channel 'C'
Channel 'D'

FIG. 96

NORMALIZATION STUDY RESULTS

NORMALIZATION METHOD	SELF TEST	INDEPENDENT TEST	VALIDATION TEST
A. WHOLE VECTOR (BASE)	95.3 %	94.5 %	92.7 %
B. PER CHANNEL	94.9 %	93.8 %	90.3 %
C. FIXED RANGE [0,4095]	95.6 %	90.3 %	88.3 %

FIG. 97

LOW THRESHOLD FILTER STUDY RESULTS

THRESHOLD LEVEL	SELF TEST	INDEPENDENT TEST	VALIDATION TEST
NONE (BASE)	95.3 %	94.5 %	92.7 %
5% OF 4095	95.3 %	94.4 %	91.9 %
10% OF 4095	95.3 %	94.3 %	92.5 %
20% OF 4095	95.1 %	94.2 %	86.4 %

FIG. 98

(1) The original image.

(2) Result from contrast enhancement.

(3) Result from pixel transfer filter.

(4) Result from morphological operator (H-dome) followed by contrast enhancement.

(5) Result from 3×3 Laplacian filter.

(6) Result from 3×3 Gaussian filter followed by max Kirsch filter, binarization, and morphological erosion.

FIG. 99

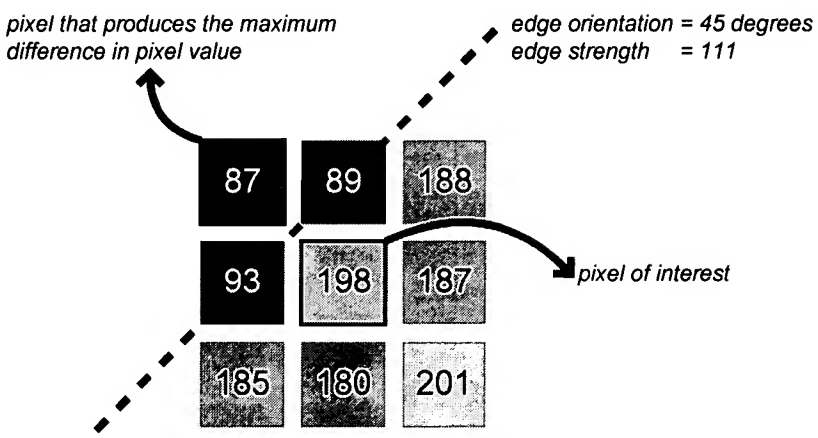
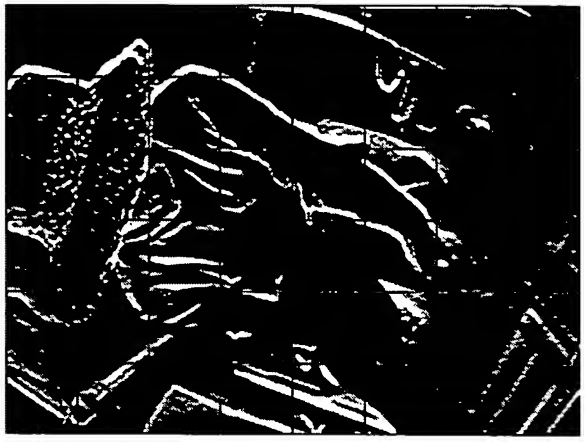
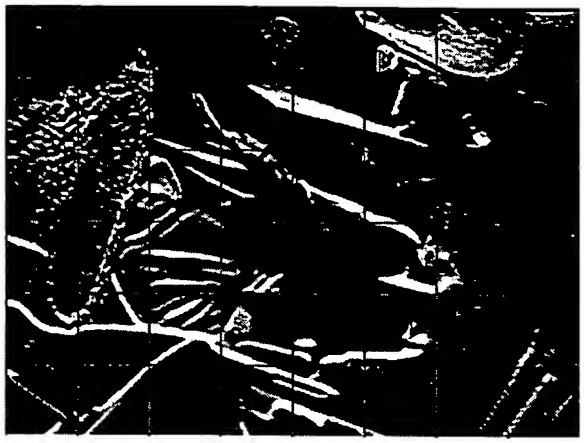

pixel that produces the maximum
difference in pixel value
edge orientation = 45 degrees
edge strength = 111
87
89
188
93
198
187
185
180
201
pixel of interest

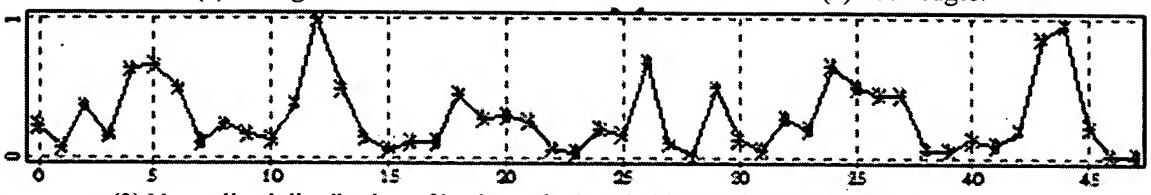
FIG. 100



(1) 0°-edges.



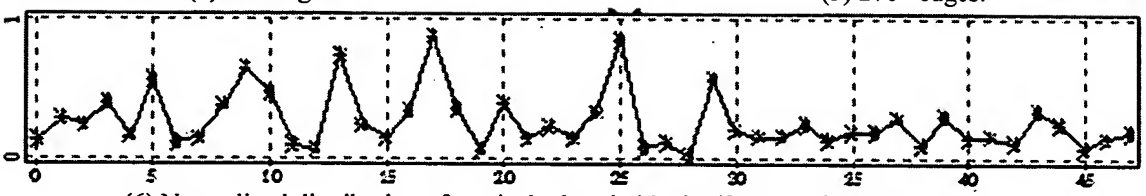
(2) 180°-edges.



(3) Normalized distribution of horizontal edges in blocks (from top-left to bottom-right).

(4) 90°-edges.

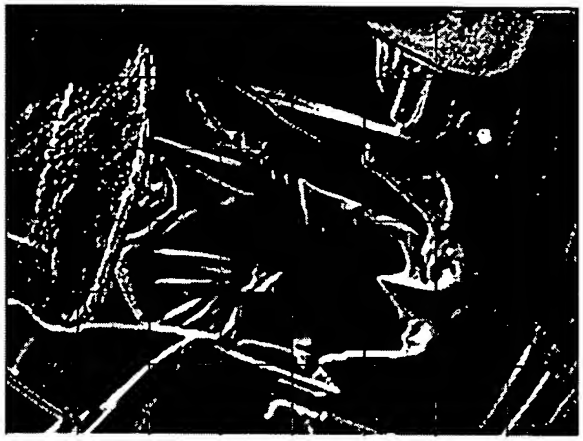
(5) 270°-edges.



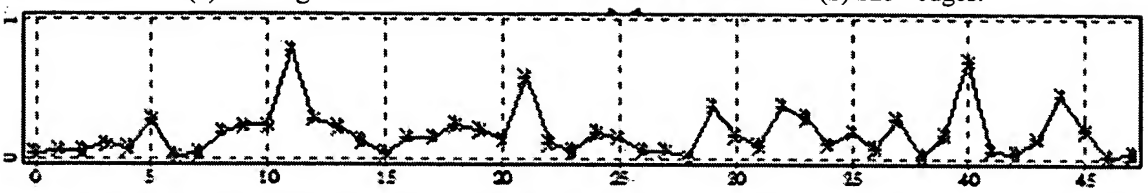
(6) Normalized distribution of vertical edges in blocks (from top-left to bottom-right).

FIG. 101

(1) 45°-edges.



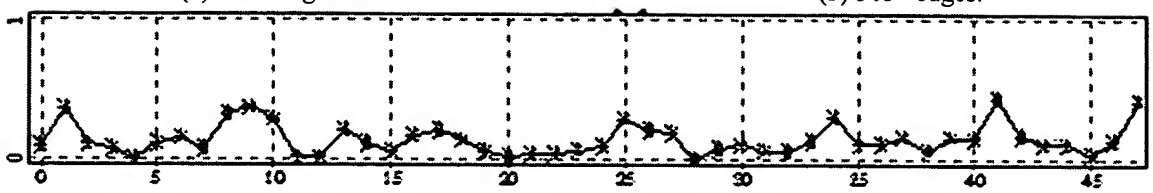
(2) 225°-edges.



(3) Normalized distribution of 45°/225°-edges in blocks (from top-left to bottom-right).

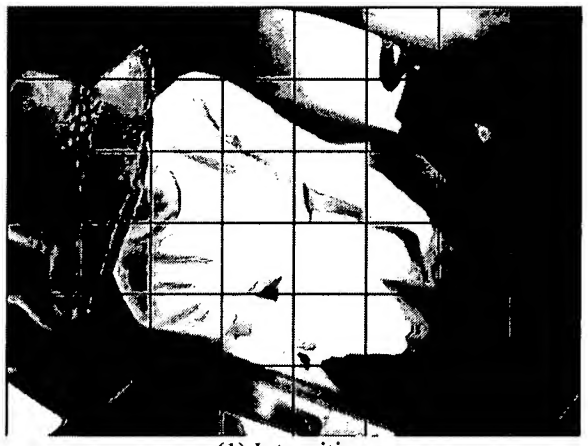
(4) 135°-edges.

(5) 315°-edges.

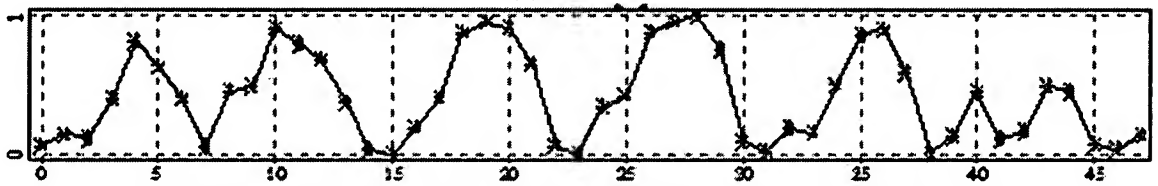


(6) Normalized distribution of 135°/315°-edges in blocks (from top-left to bottom-right).

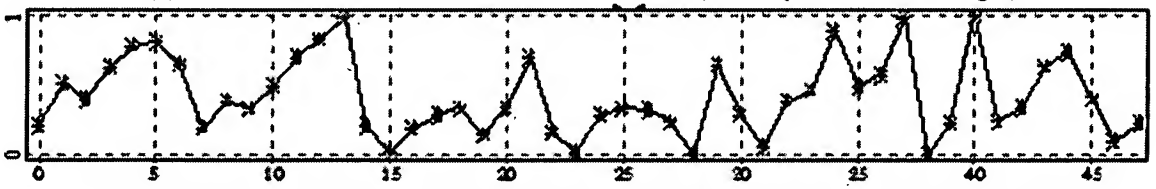
FIG. 102



(1) Intensities.



(2) Normalized distribution of intensities in blocks (from top-left to bottom-right).



(3) Normalized distribution of intensity deviations in blocks (from top-left to bottom-right).

FIG. 103

Vehicle Configuration	Occupant	Child Restraint	Lighting Condition
▪Seat track position ▪Seatback recline position ▪Other interior fixture configurations (such console, glove box, seatbelt, etc.)	▪Height ▪Weight ▪Clothing ▪Hair and facial hair ▪Skin tone ▪Seating position ▪Personal objects	▪NHTSA FMVSS208 approved 11 rear-facing child restraints, 7 forward-facing child restraints, and 4 booster seats.	▪Nighttime condition ▪Sunlight at different time of the day and/or different vehicle orientation ▪Dome light ▪Door light ▪Headlight from other vehicle

FIG. 104

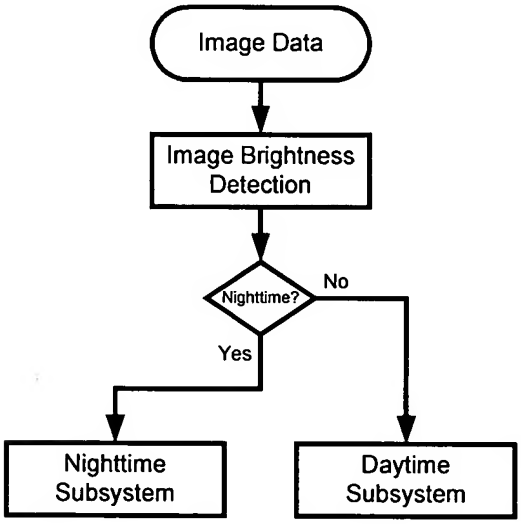
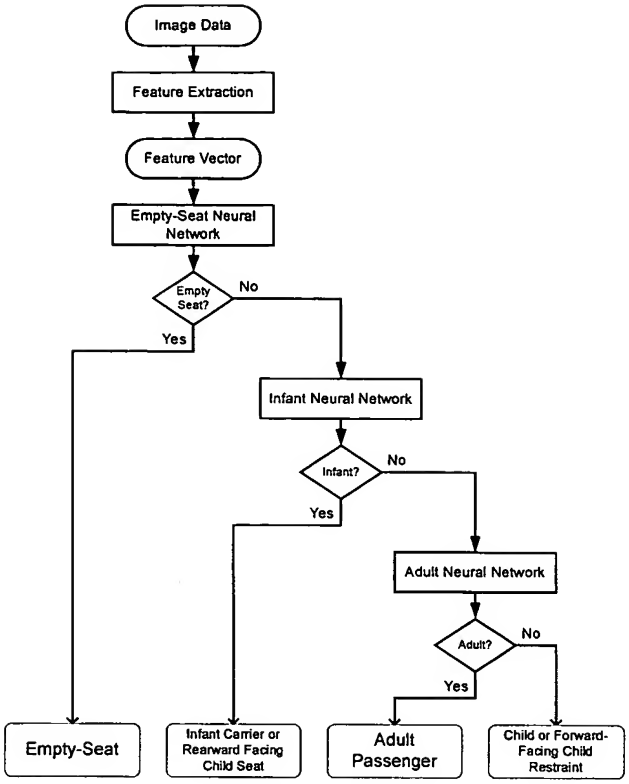
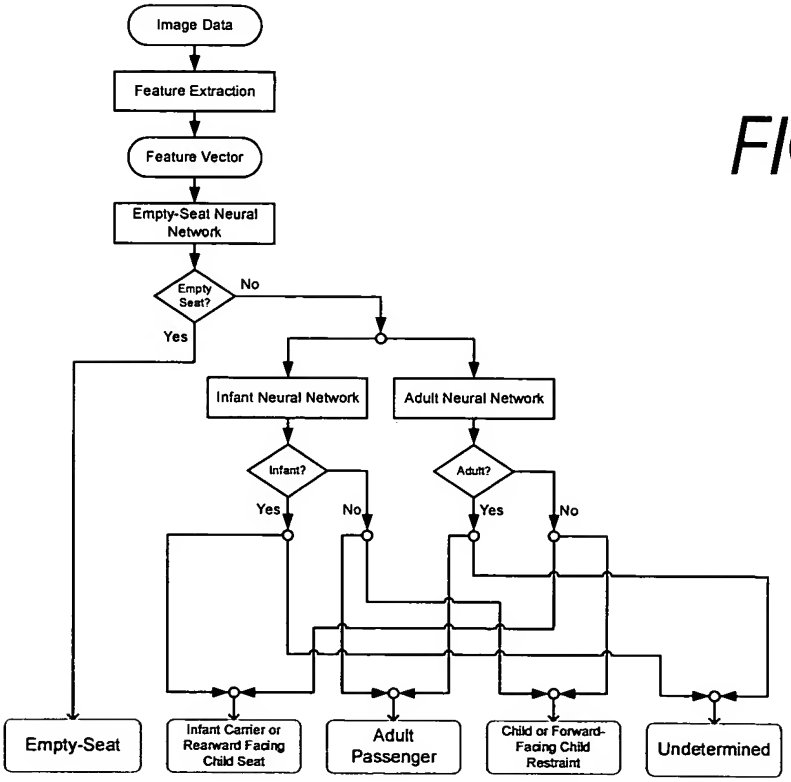


FIG. 105



(1) Architecture #1.



(2) Architecture #2.

FIG. 106

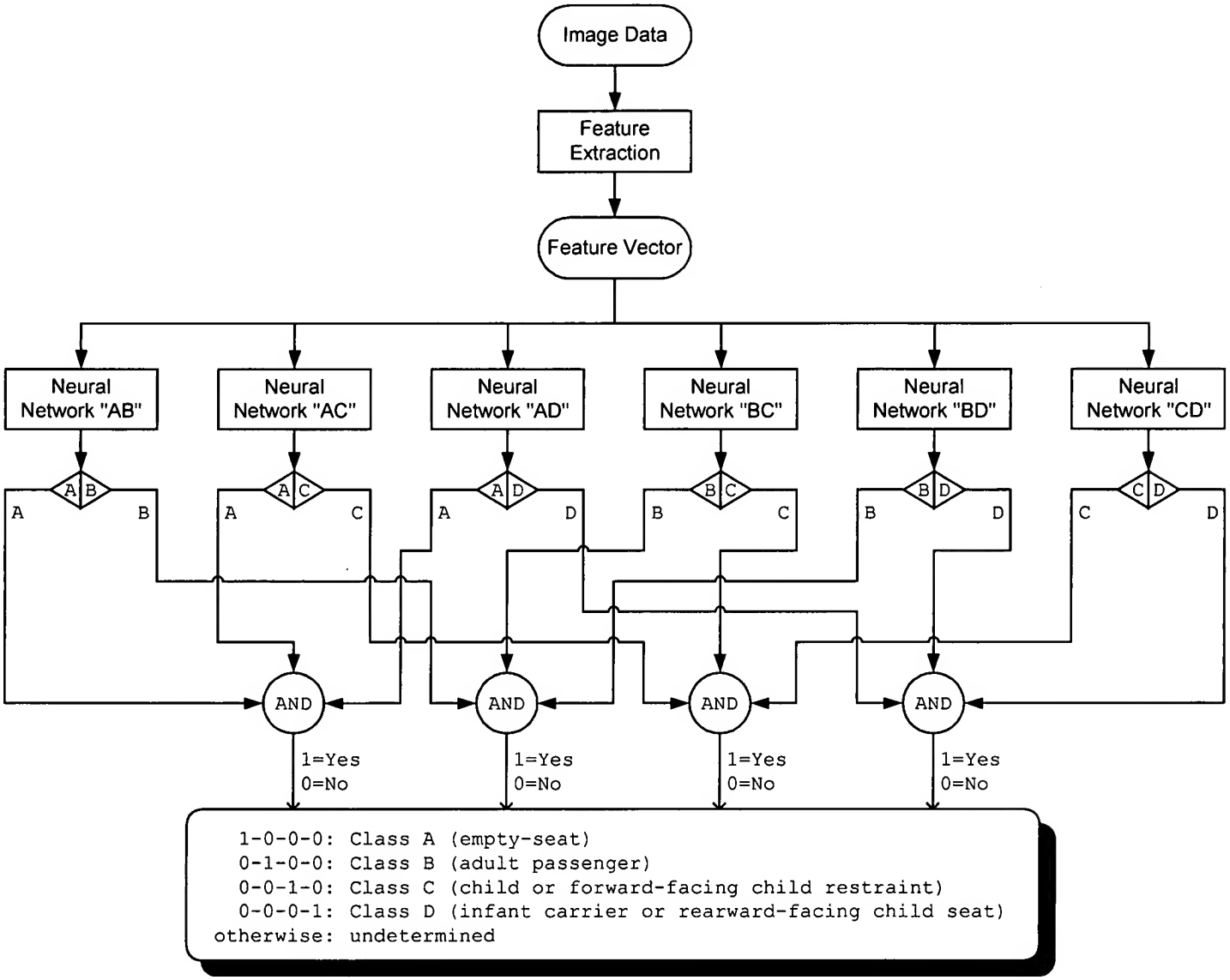


Image Data
Feature Extraction
Feature Vector
Neural Network "AB"
Neural Network "AC"
Neural Network "AD"
Neural Network "BC"
Neural Network "BD"
Neural Network "CD"
A B
A C
A D
B C
B D
C D
A
B
C
D
AND
AND
AND
AND
1=Yes
0=No
1=Yes
0=No
1=Yes
0=No
1=Yes
0=No
1-0-0-0: Class A (empty-seat)
0-1-0-0: Class B (adult passenger)
0-0-1-0: Class C (child or forward-facing child restraint)
0-0-0-1: Class D (infant carrier or rearward-facing child seat)
otherwise: undetermined

FIG. 107

- Generic digital filter
- Kalman filter
- Median filter
- ATI's post-decision filter

FIG. 108

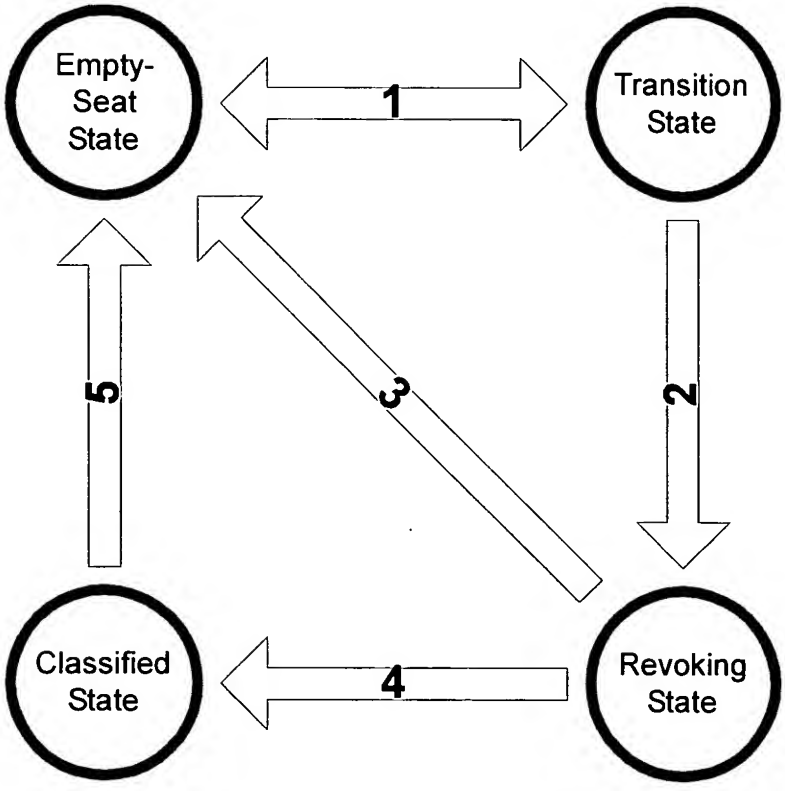


FIG. 109

Empty-Seat State	The system starts from Empty-Seat State, and returns to Empty-Seat State every time when the incoming classification becomes empty-seat.
Transition State	The system is allowed to change classification freely in Transition State.
Revoking State	Classification change is more restricted in Revoking State. The system is allowed to change classification only if the new classification lasts longer than the old one.
Classified State	In classified State, classification change is either prohibited, or allowed only after the new classification has lasted for a very very long time.

FIG. 110

Path #1	The system moves from Empty-Seat State to Transition State if the incoming classification is not empty-seat. The system moves from Transition State to Empty-Seat State if the incoming classification becomes empty-seat.
Path #2	The system moves from Transition State to Revoking State if the incoming classification lasts more than certain amount of time (T_1) without toggling.
Path #3	The system moves from Revoking State to Empty-Seat State if the incoming classification becomes empty-seat.
Path #4	The system moves from Revoking State to Classified State if the incoming classification lasts more than certain amount of time (T_2) without toggling. Usually $T_2 >> T_1$.
Path #5	The system moves from Classified State to Empty-Seat State if the incoming classification becomes empty-seat.

FIG. 111

Adult	Child and Forward-Facing Child Restraint	Infant Carrier and Rearward-Facing Child Seat	Empty Seat
37.24%	21.60%	35.43%	5.73%

FIG. 112

		Empty-Seat Network	Infant Network	Adult Network
Network Name		R174ES05	R174RS01	R174AD02
Network Structure		300×3×1	300×10×7×1	300×15×10×1
Success Rate	Adult	99.97%	98.85%	97.80%
	Child & FFCS	98.50%	99.47%	98.57%
	Infant Carrier & RFCS	100%	99.43%	98.93%
	Empty Seat	99.98%	100% †	99.60%

FIG. 113

		Classified As				
		Adult	Child & FFCS	Infant Carrier & RFCS	Empty Seat	Undetermined
Target Class	Adult	**96.97%**	1.86%	0.33%	0.03%	0.81%
	Child & FFCS	1.43%	**96.55%**	0.52%	1.50%	0%
	Infant Carrier & RFCS	0.17%	0.40%	**98.53%**	0%	0.90%
	Empty Seat	0.02%	0%	0%	**99.98%**	0%

FIG. 114

Adult	Child and Forward-Facing Child Restraint	Infant Carrier and Rearward-Facing Child Seat	Empty Seat
33.33%	13.33%	33.33%	20.00%

FIG. 115

		Empty-Seat Network	Adult Network
Network Name		R172ES01	R172CS03
Network Structure		340×7×5×1	340×20×15×1
Success Rate	Empty Seat	99.32%	—
	Adult	99.09%	98.20%
	Child & Child Restraint	99.44%	99.27%

FIG. 116

		Classified As		
		Empty Seat	Adult	Child & Child Restraint
Target Class	Empty Seat	**99.32%**	0.67%	0.01%
	Adult	0.91%	**97.74%**	1.35%
	Child & Child Restraint	0.56%	0.69%	**98.75%**

FIG. 117

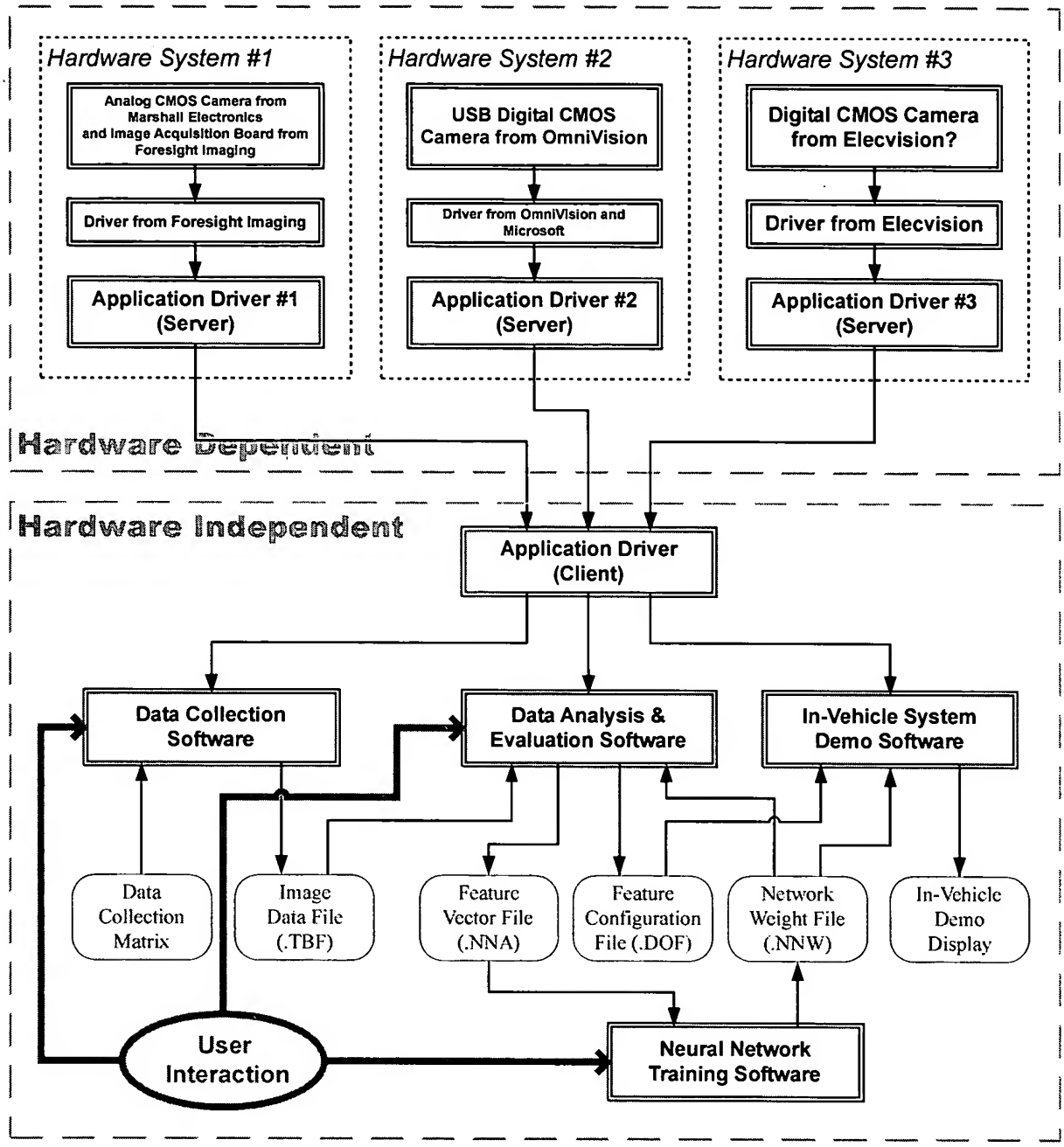

Hardware System #1
Analog CMOS Camera from Marshall Electronics and Image Acquisition Board from Foresight Imaging
Driver from Foresight Imaging
Application Driver #1 (Server)
Hardware System #2
USB Digital CMOS Camera from OmniVision
Driver from OmniVision and Microsoft
Application Driver #2 (Server)
Hardware System #3
Digital CMOS Camera from Elecvision?
Driver from Elecvision
Application Driver #3 (Server)
Hardware Dependent
Hardware Independent
Application Driver (Client)
Data Collection Software
Data Analysis & Evaluation Software
In-Vehicle System Demo Software
Data Collection Matrix
Image Data File (.TBF)
Feature Vector File (.NNA)
Feature Configuration File (.DOF)
Network Weight File (.NNW)
In-Vehicle Demo Display
User Interaction
Neural Network Training Software

FIG. 118

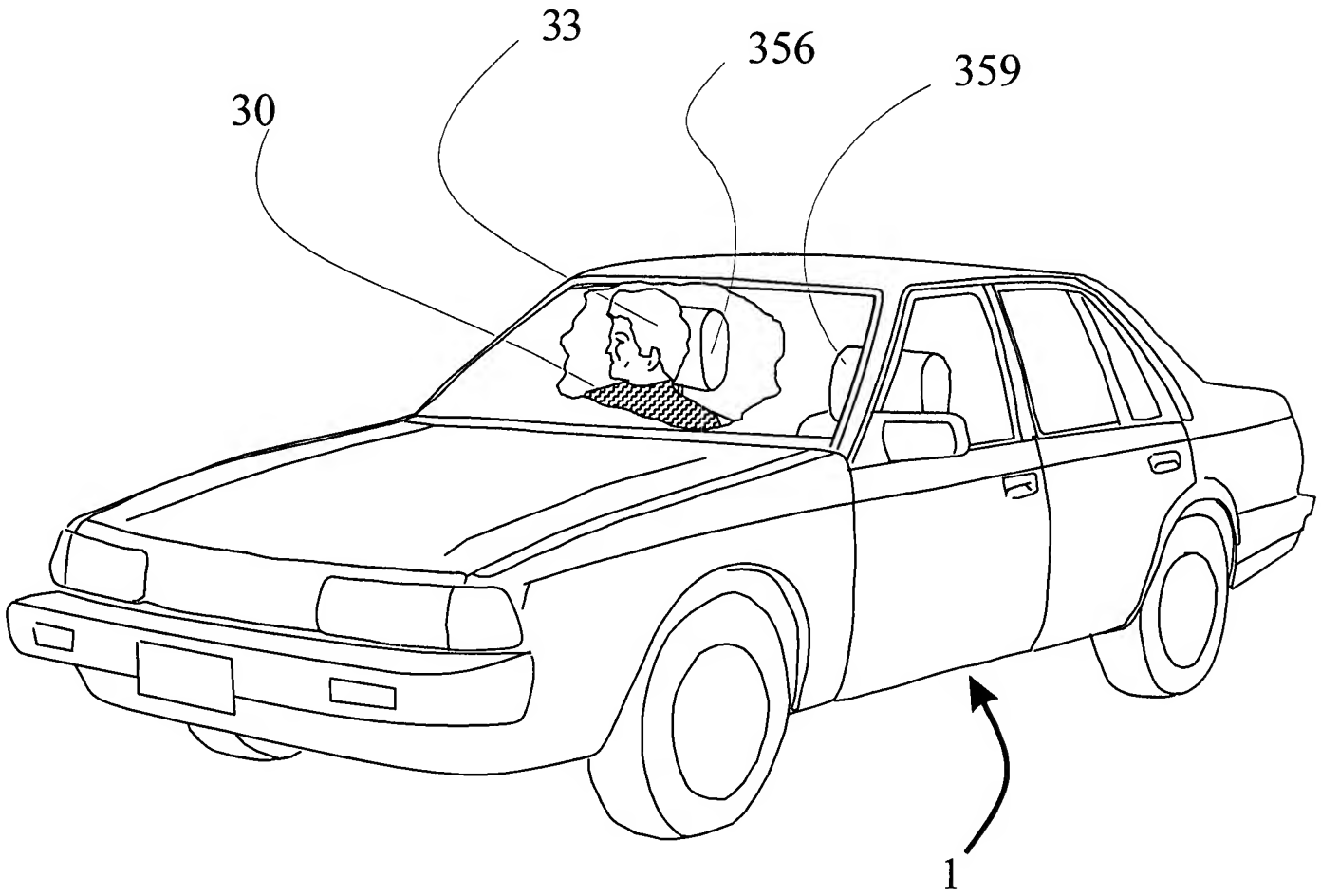


FIG. 119

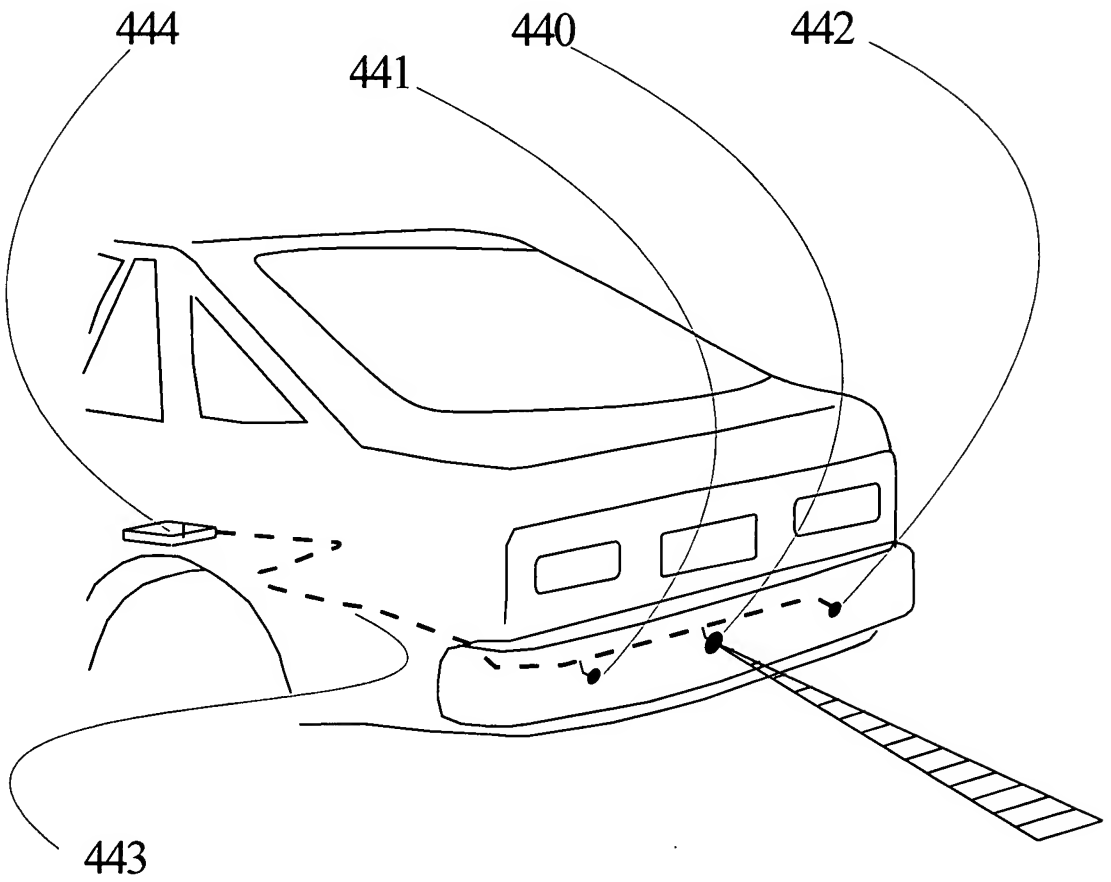


FIG. 120

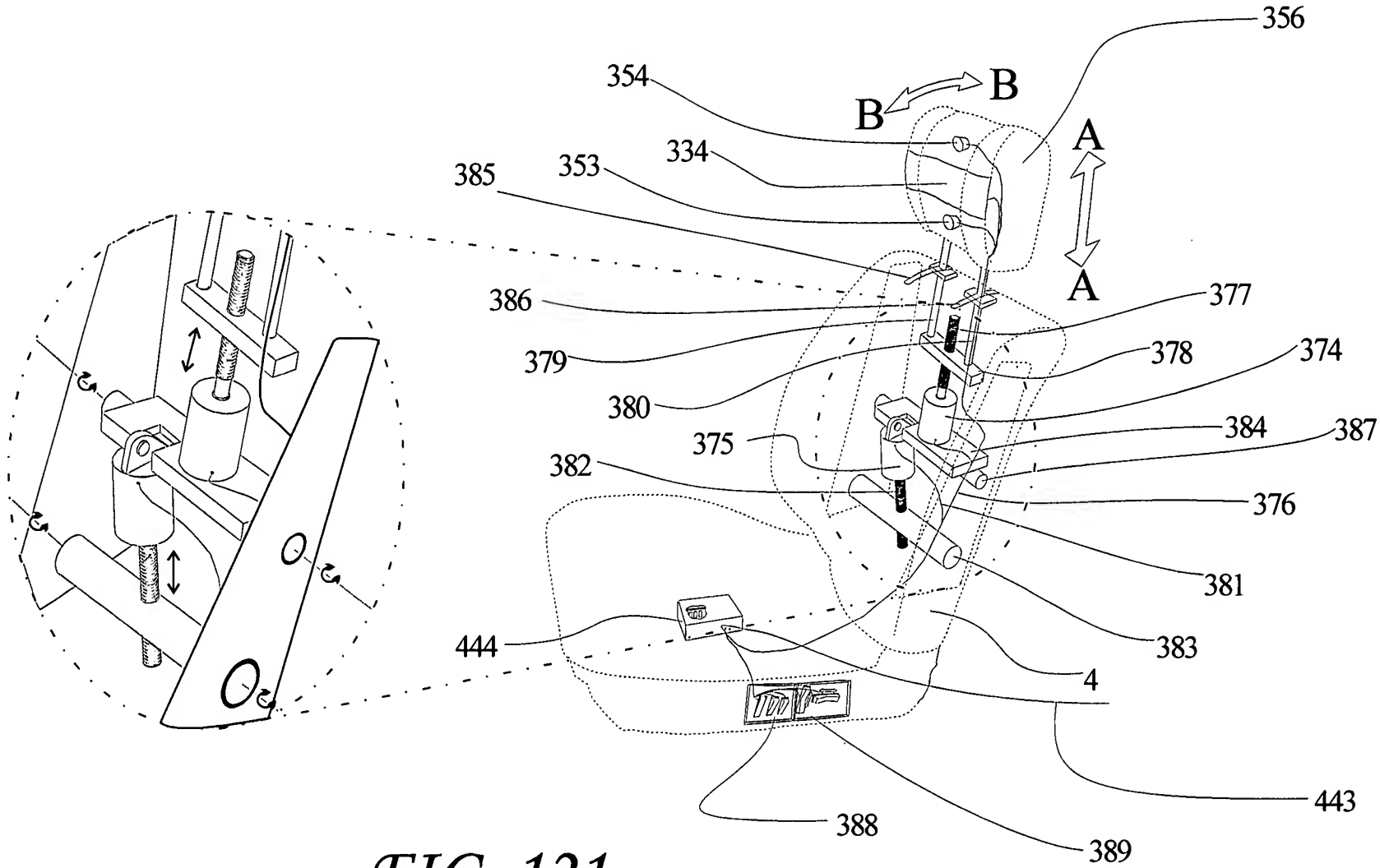

356
354
B
B
A
A
334
353
385
386
377
379
378
374
380
384
387
375
382
376
381
383
444
4
443
388
389

FIG. 121

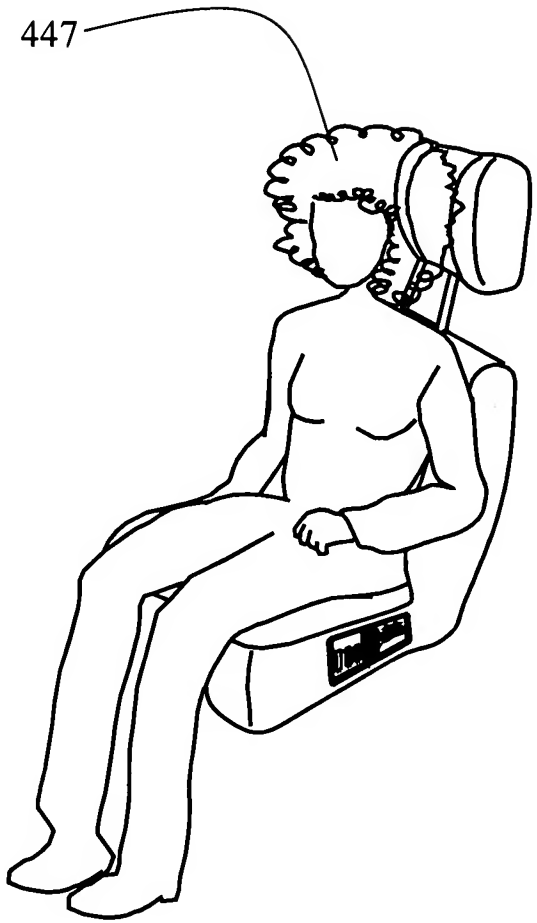


FIG. 122

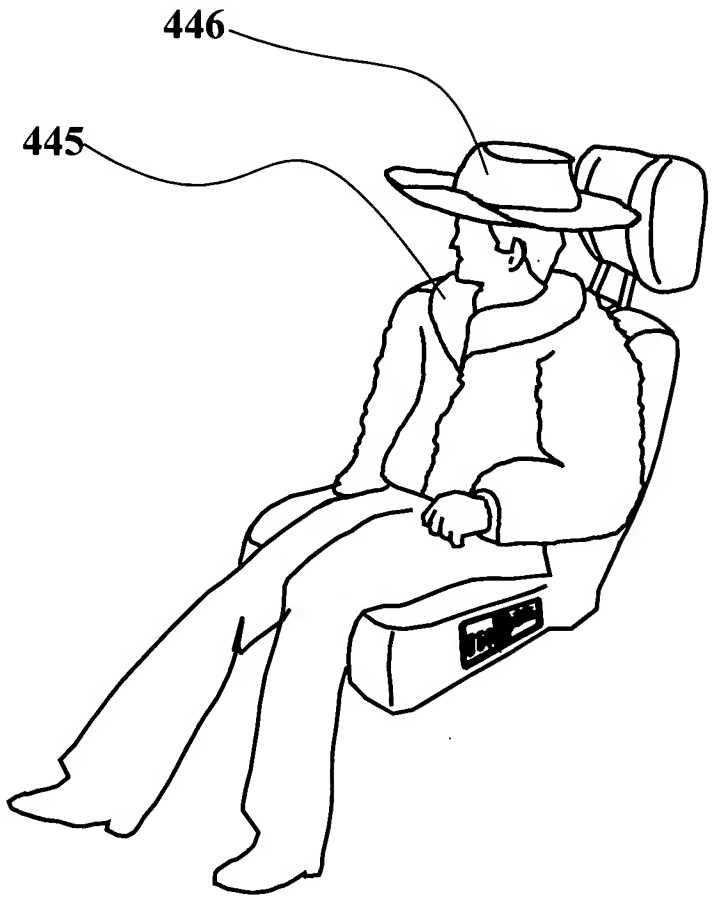


FIG. 123

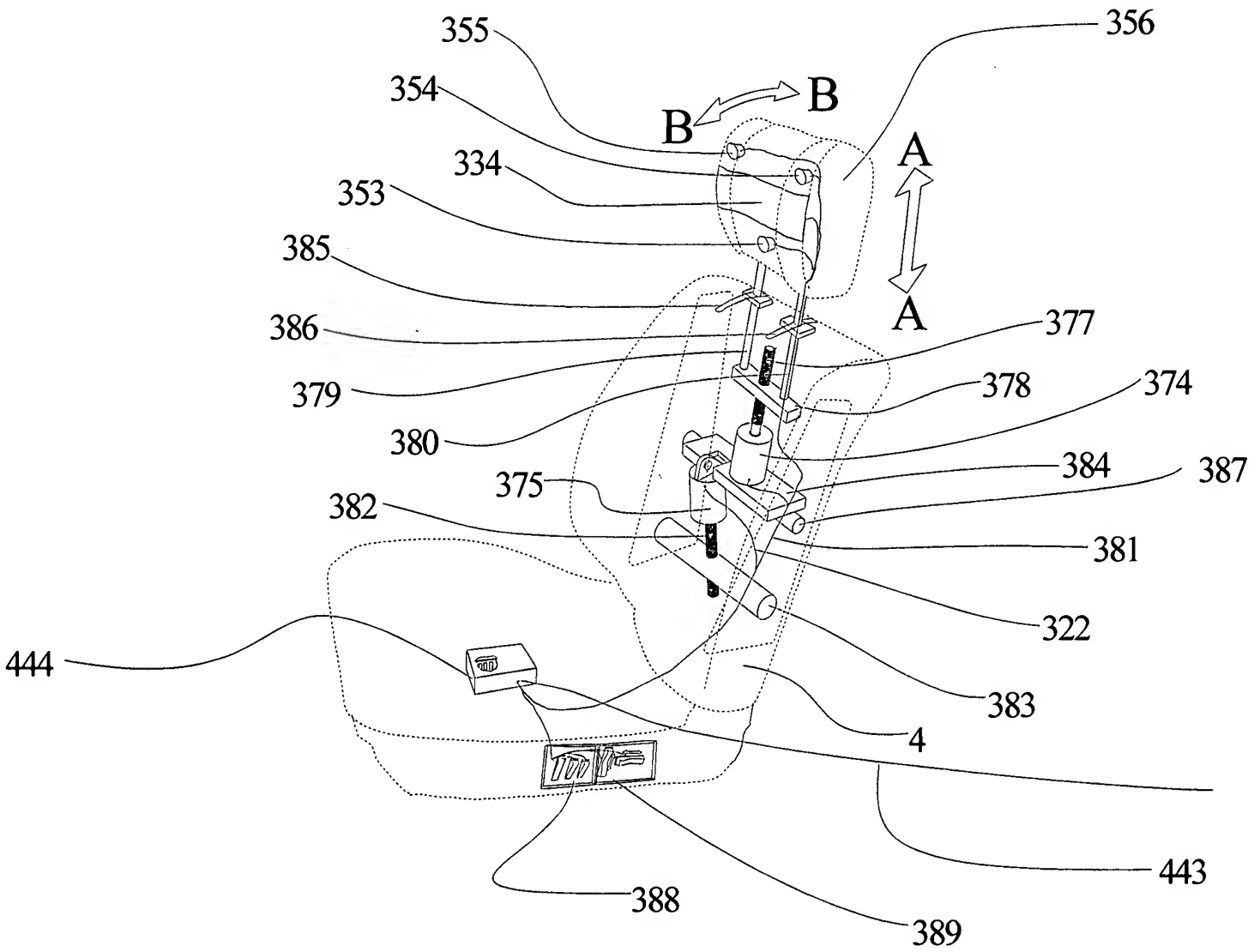

355
356
354
B
B
334
A
353
385
A
386
377
379
378
374
380
384
387
375
382
381
322
444
383
4
443
388
389

FIG. 124

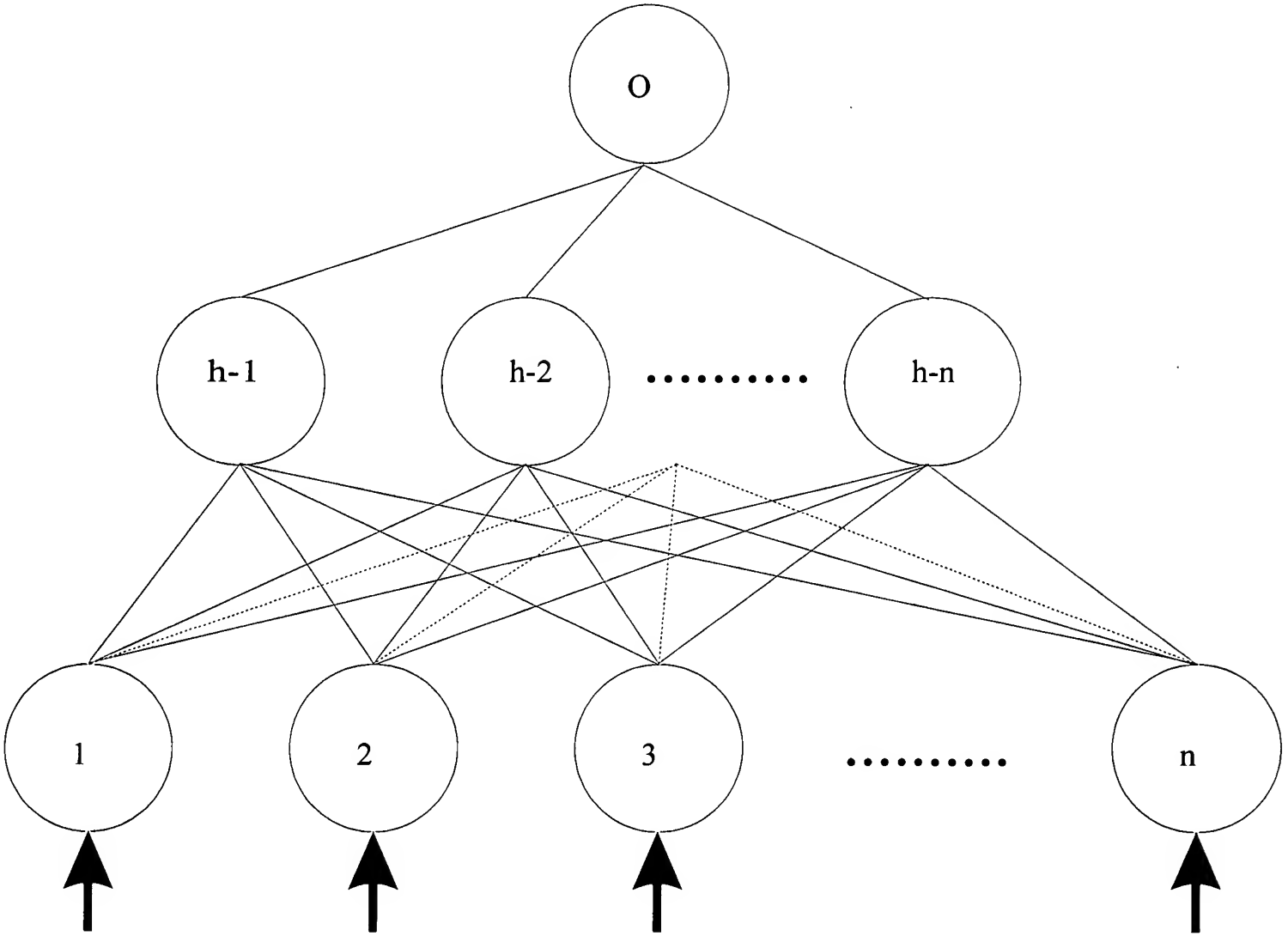


Fig. 125

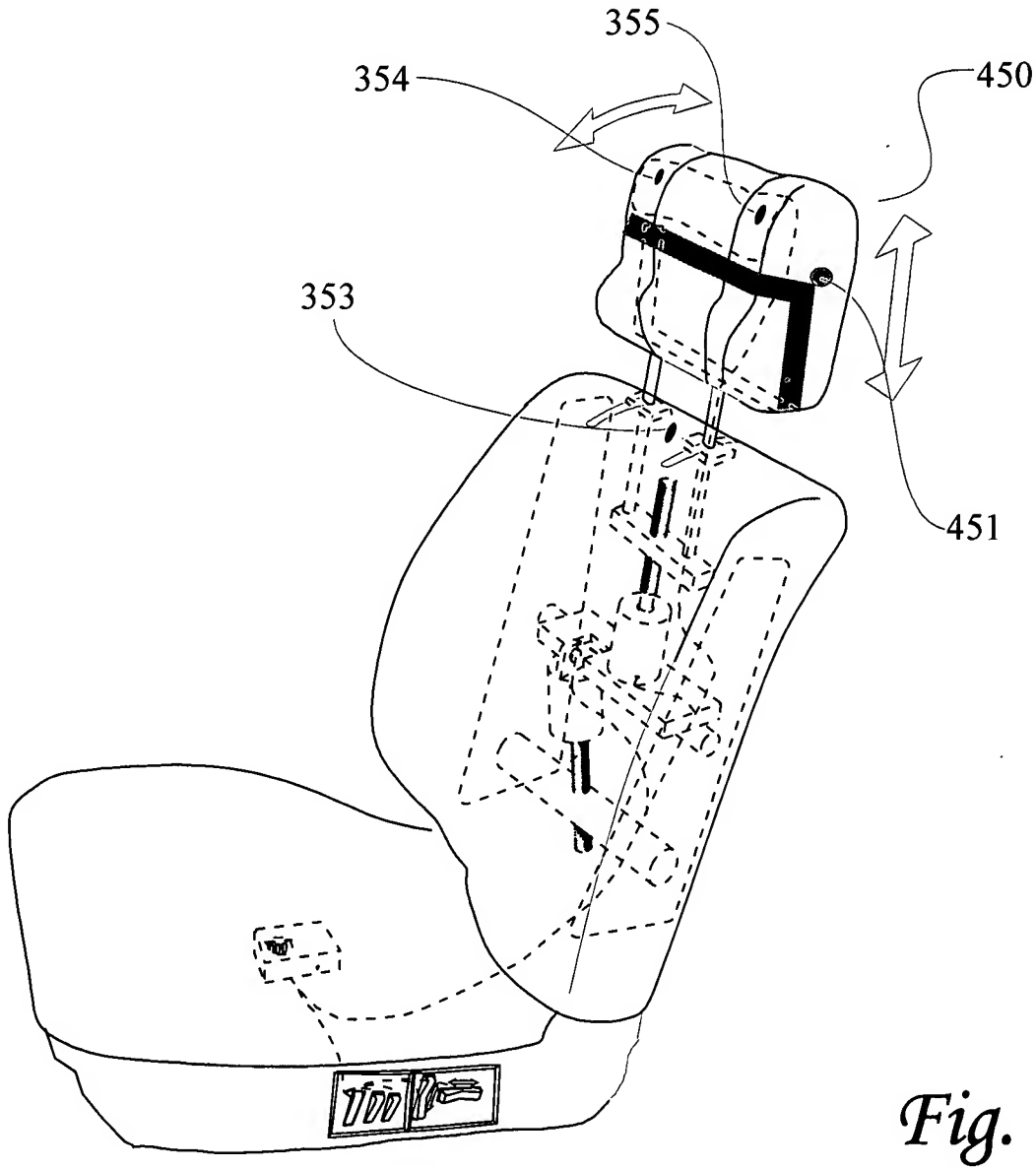


Fig. 126

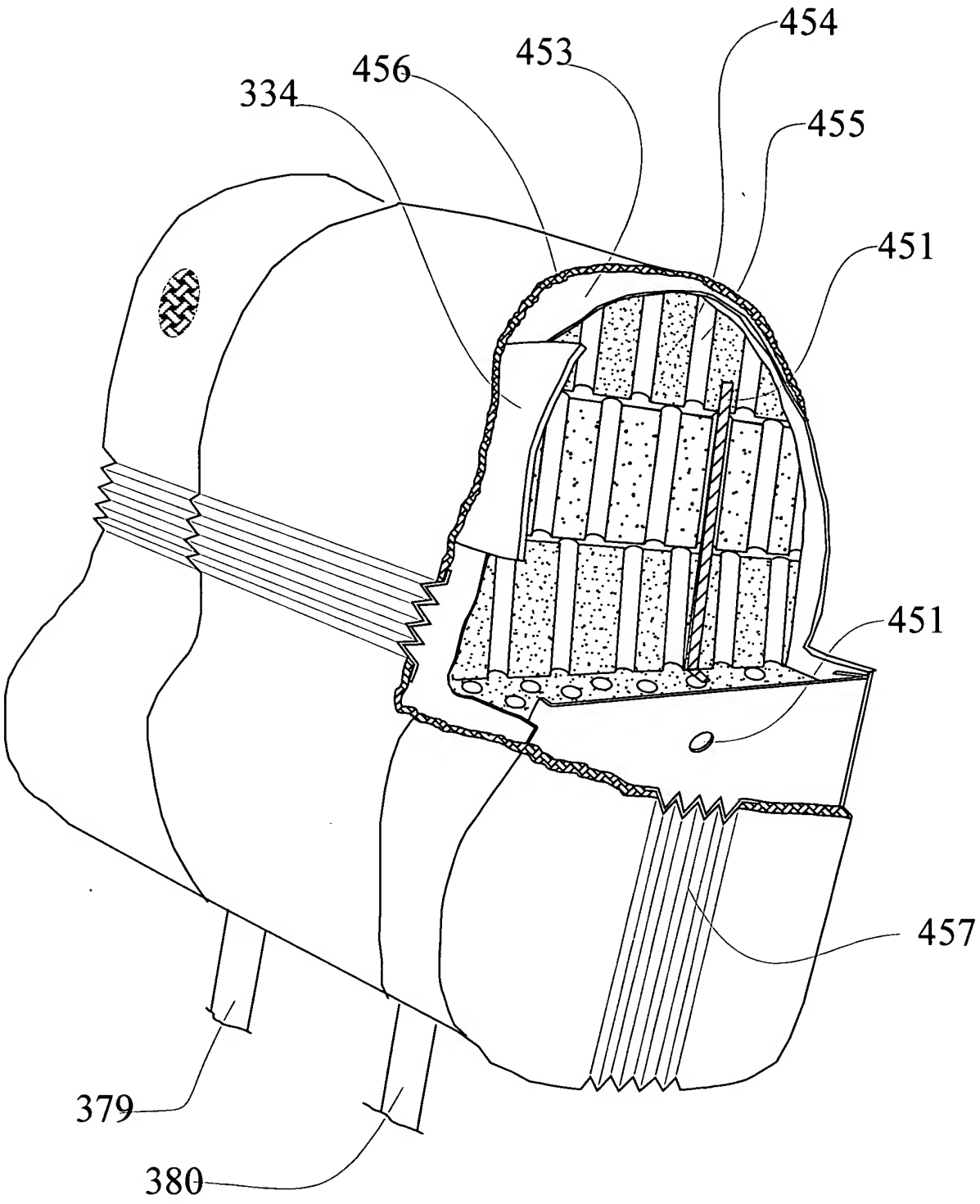


Fig. 126A

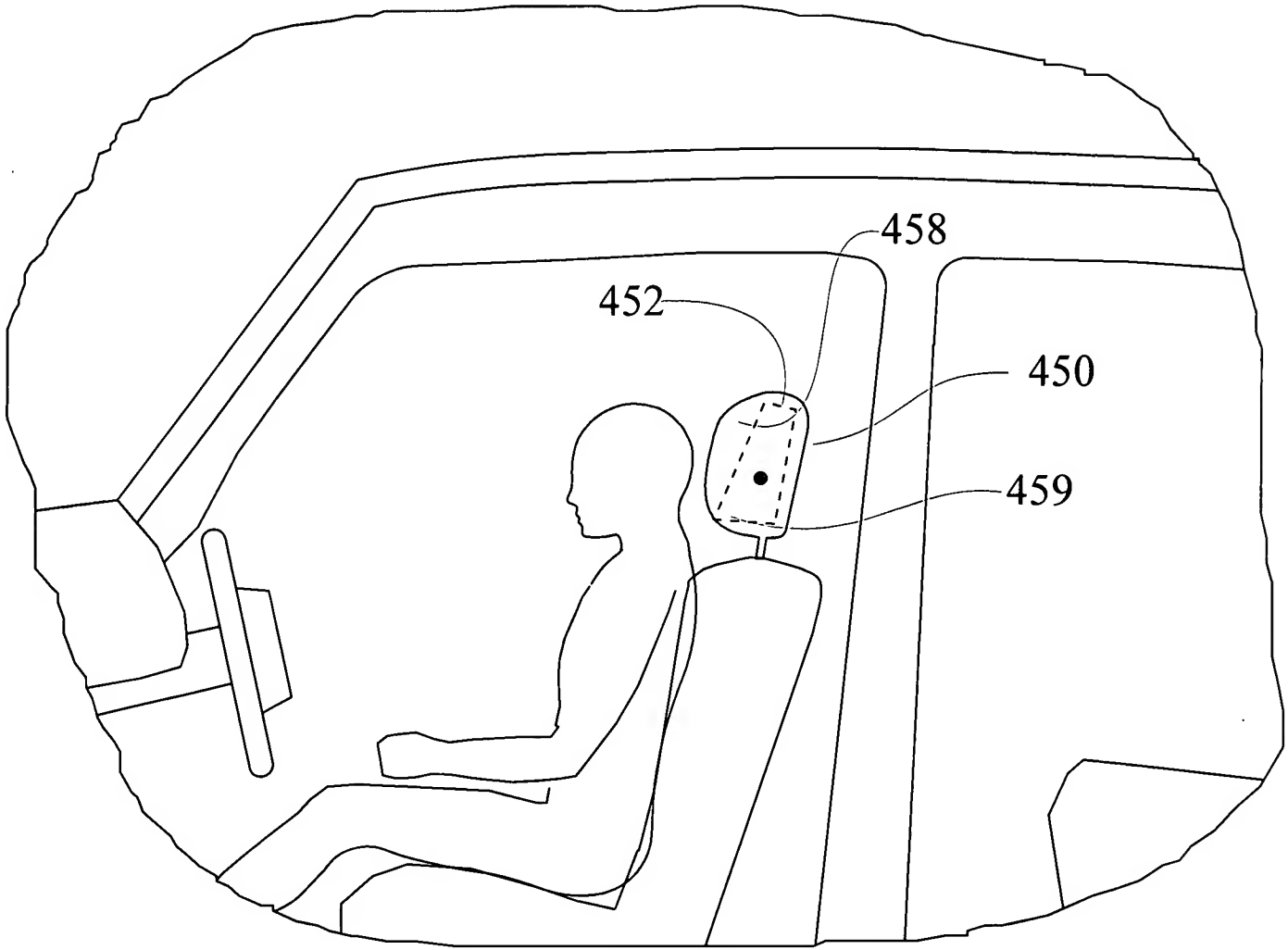


Fig. 127A

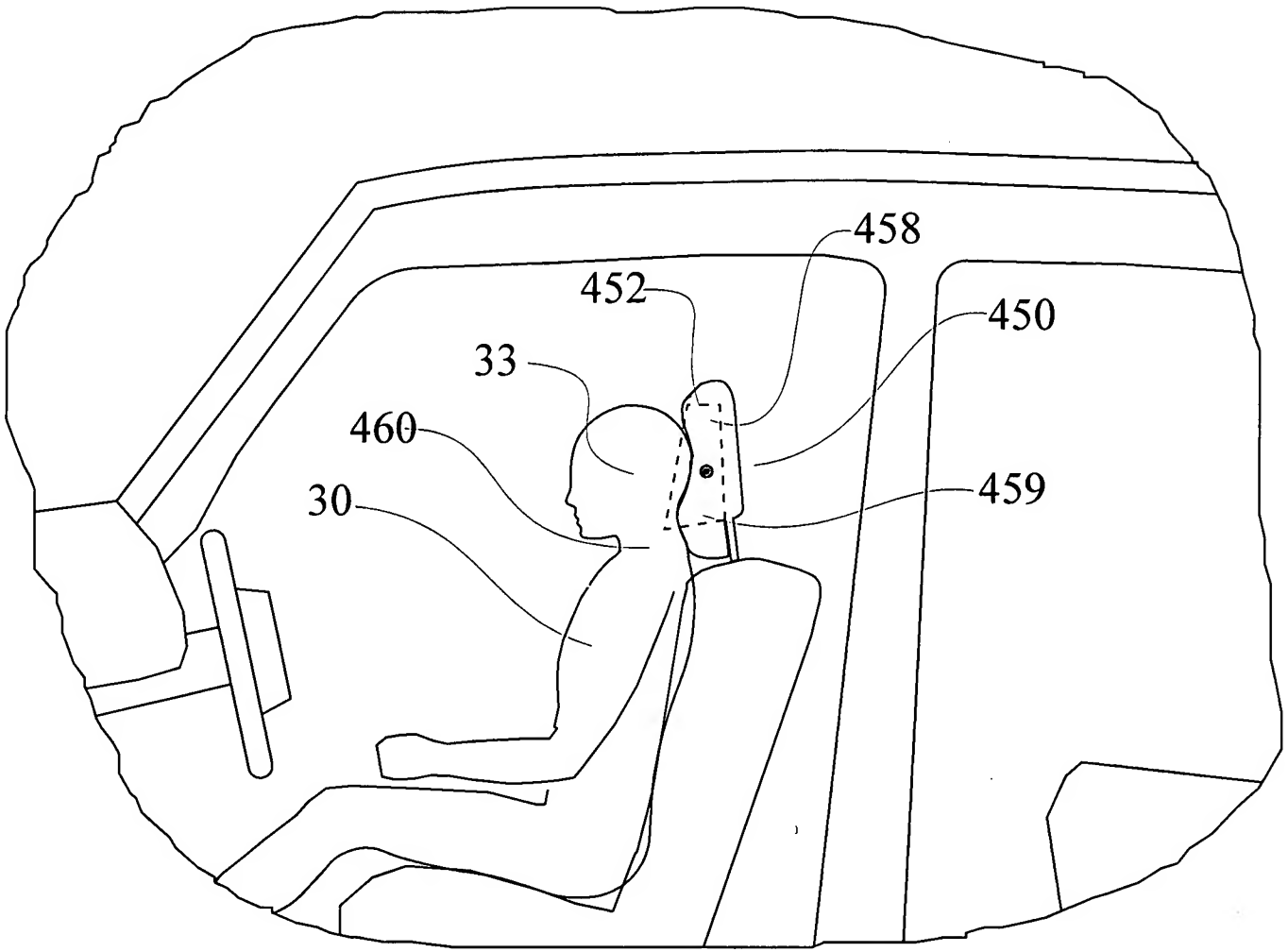


Fig. 127B

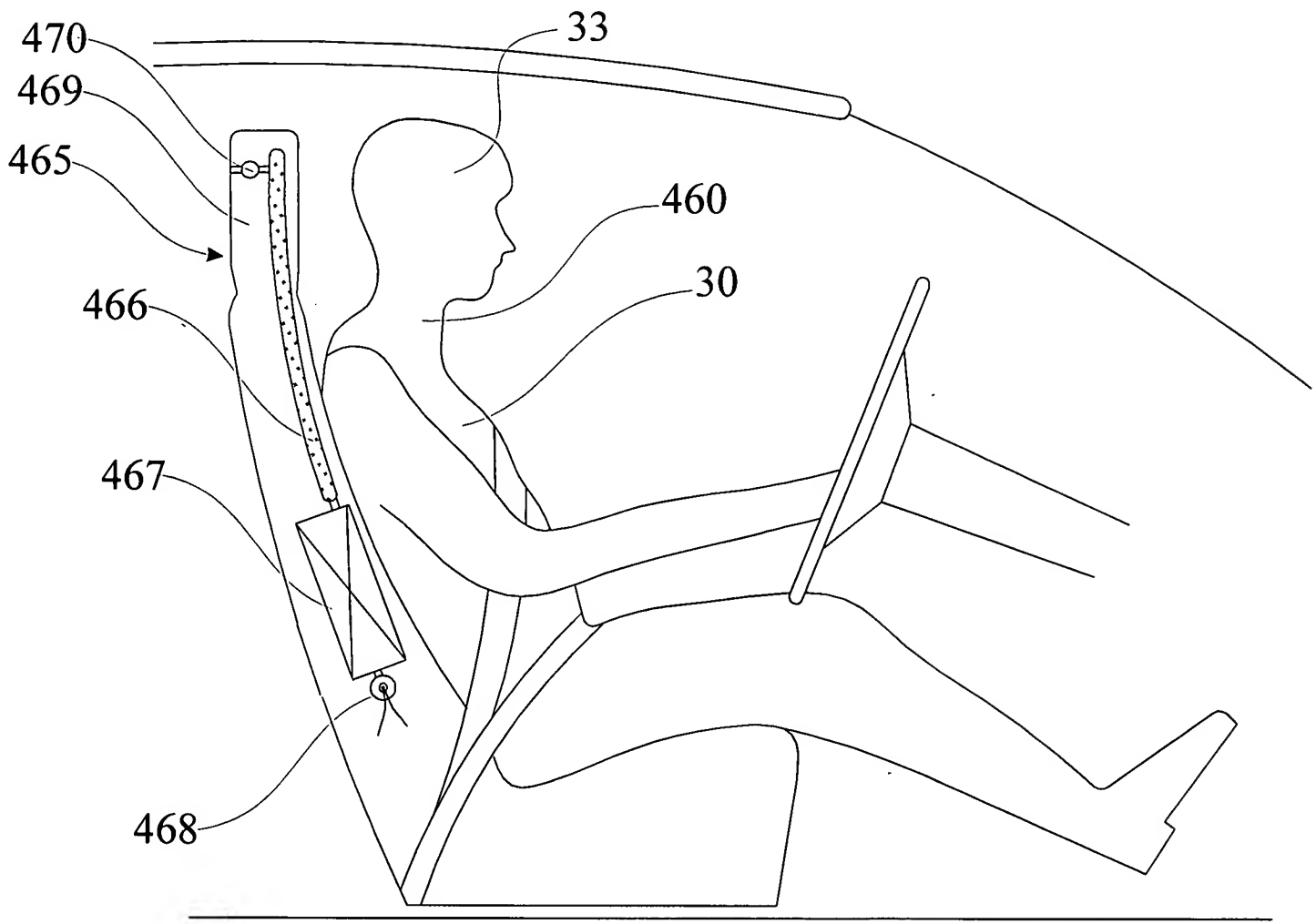


Fig. 128A

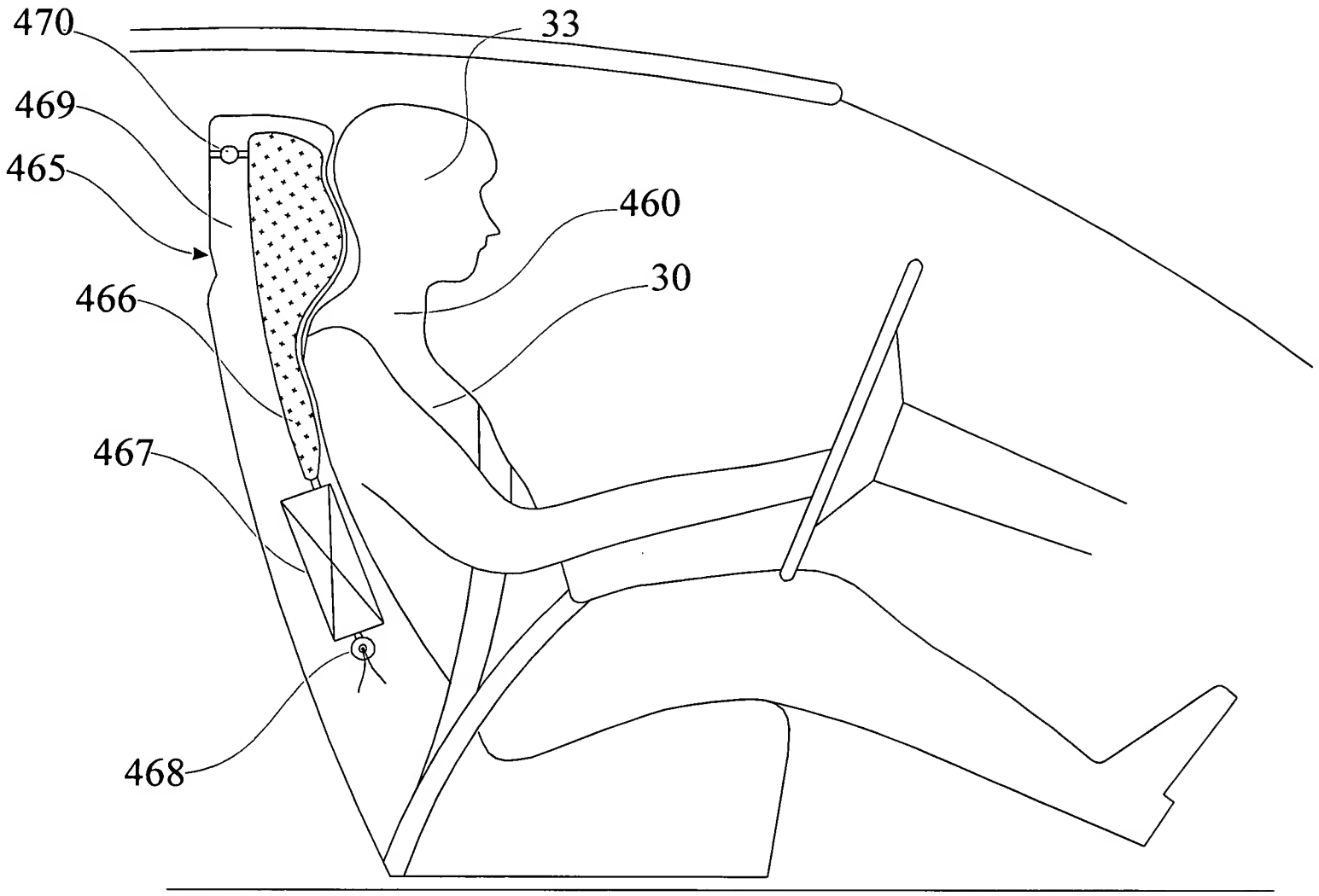


Fig. 128B

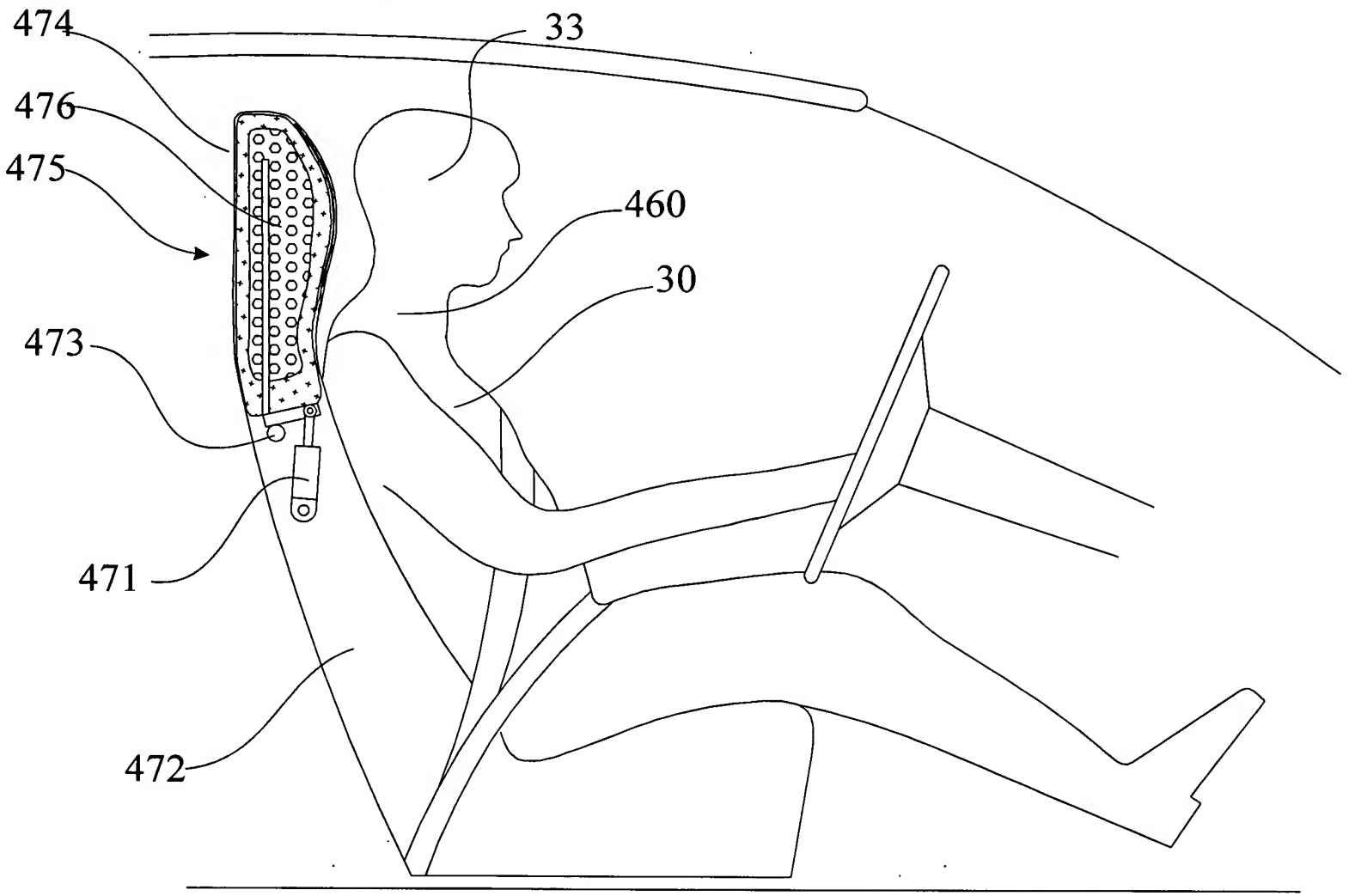


Fig. 129A

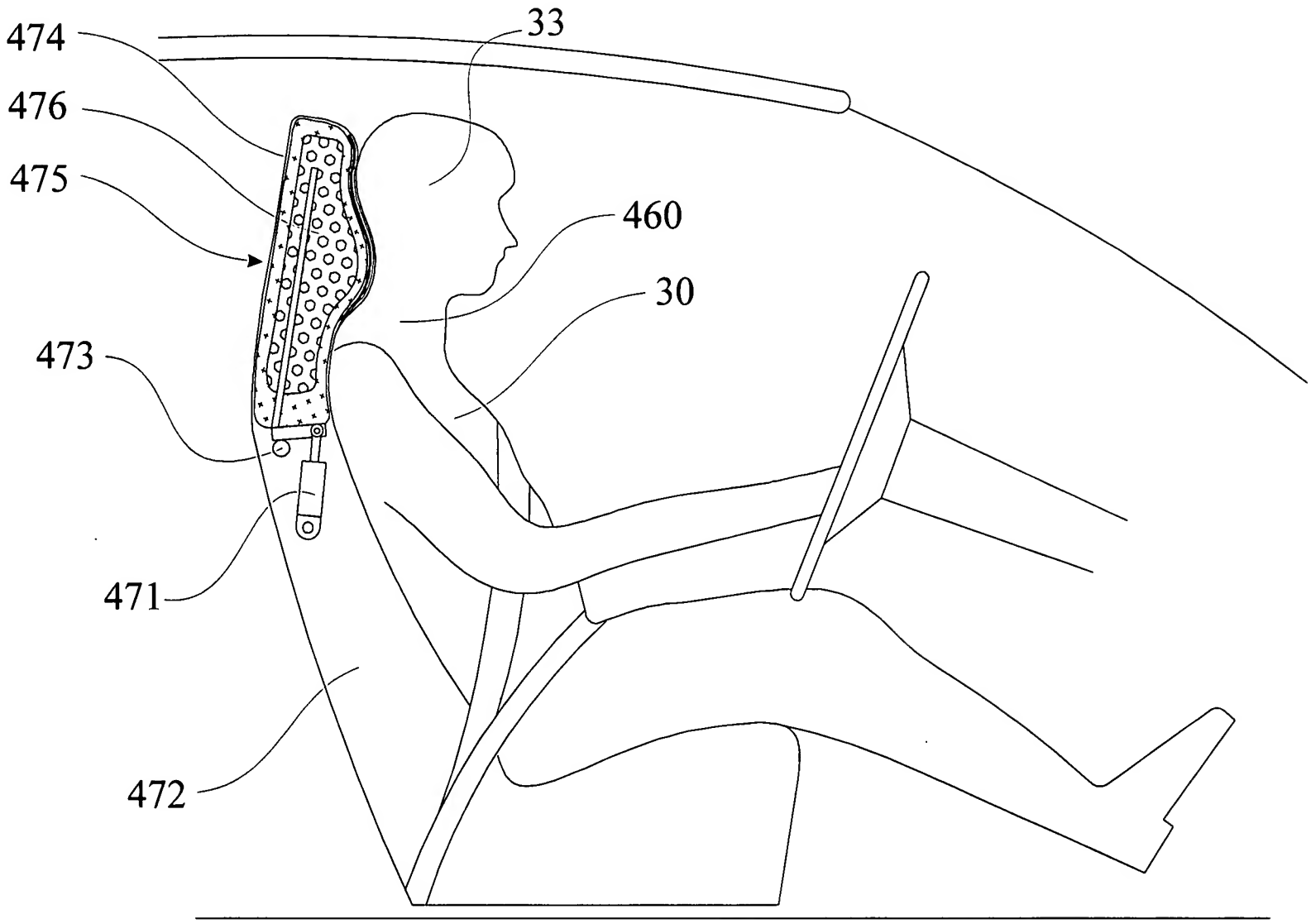


Fig. 129B